FIVE-FIELD NATURAL GASOLINE PLANT

the OIL AND GAS JOURNAL

PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 OCTOBER 19, 1953

Good reasons why Lane-Wells does the job — better!

Just to be SURE we give you the truth...

...Lane-Wells Radioactivity Well Logging instruments are tested before and after every run in the hole

If well data is to be of value, it has to be *right*. That's why we take double care to be certain of the consistent accuracy of the sensitive logging instruments. And to make certain, we've engineered our own special testing instruments, like the radioactivity electrometer test unit in the photo, designed, engineered and built by Lane-Wells. Takes time and costs money, but it's the only way to give you what you want — complete, accurate, detailed *dependable* down-hole information. It's one more reason why so many operators plan their completions with

Tomorrow's Tools - Today!

LANE WELLS COMPANY

Radioactivity Well Logging

General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58

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The OIL AND GAS JOURNAL

OCTOBER 19, 1953 VOL. 52 NO. 24

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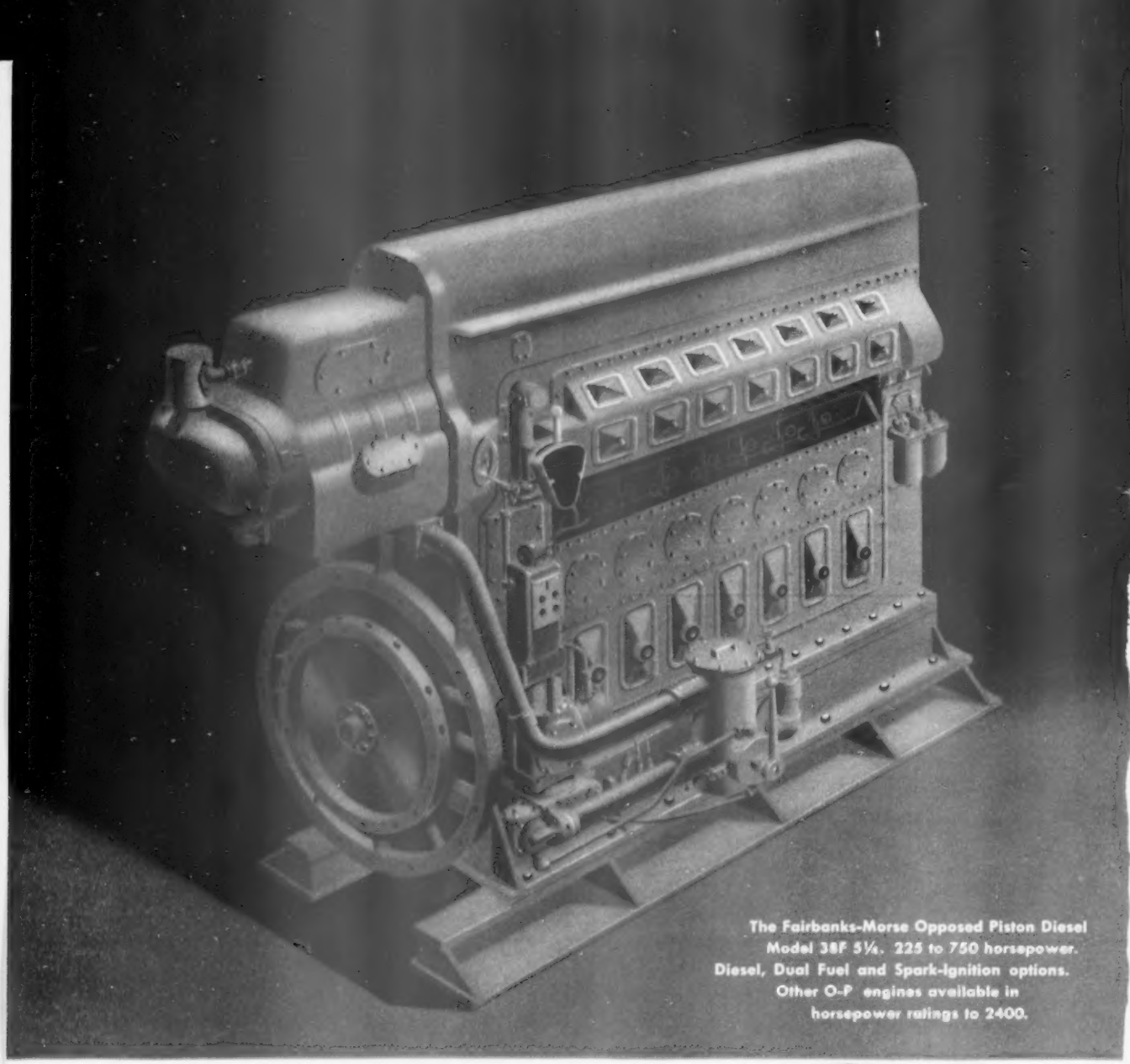
In Brief . . .

1. **UNIQUE GASOLINE PLANT . . .** The Reef Fields natural-gasoline plant near Big Spring, Tex., has these unusual features: (1) A gas-gathering system which extends 30 miles from end to end and which handles all the casing-head-gas production from five oil fields; (2) product capacity of 291,000 gal. of products per day while using less than 90 g.p.m. of makeup water; (3) all liquid products from the fractionating towers make directly into plant storage tanks 15 miles away; (4) the plant contains no reabsorbers or recompressors, but recovers 94 per cent of the propane and essentially all of the heavier components; (5) utilization of fuel-gas pressure reduction to gas-turbine drive all lean-oil pumps; (6) washing out of salt cavities for underground storage with waste water originally produced from water wells 40 miles away; (7) over 160 miles of field and transfer lines installed as a part of plant operations; and (8) plant instrumentation is especially well integrated.

2. **NEW LIGHT ON MUDS . . .** Oil-emulsion drilling muds offer the following advantages: (1) In practically all cases where records have been kept on its use, economies have been effected in the rate of penetration; (2) a definite increase in the life of the bit has generally been accomplished; (3) borehole conditions are considerably improved and maintained; (4) mud pumps and systems are more easily and economically maintained; (5) water loss from the mud column is lessened, but balling is inhibited, and lubrication is improved; and (6) better completion results are obtained. However, choice of drilling fluid depends on the conditions encountered in a particular well. These drilling conditions should be thoroughly analyzed before a decision is made.

3. **REFINING ECONOMY . . .** While use of cast iron in the modern refinery is limited by its rather low tensile strength and its brittle nature, it can be used economically in many applications such as: (1) Cooler coils for noncorrosive oil streams; (2) pumps for heavier fractions where conditions do not exceed 250° psia. and 250° F.; (3) in certain distillation column applications; and (4) for channels, floating-head covers, and bonnets for certain heat exchangers.



The Fairbanks-Morse Opposed Piston Diesel
Model 38F 5¼. 225 to 750 horsepower.
Diesel, Dual Fuel and Spark-Ignition options.
Other O-P engines available in
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It was designed and built without thought of price . . . built only to give the maximum of heavy-duty horsepower in a minimum of space . . . plus an unvarying reliability upon which you could stake a balance sheet of operating costs and profits.

The price?

Not quite as low as conventionally designed and conventionally manufactured engines, but low enough to insure that no one who wants and needs an engine which gives more, need forego its ownership. For the more difficult tasks of producing power, this engine is a fulfilling answer.

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No other steam turbine offers you

SUCH VERSATILE STEAM NOZZLE CONTROL

The larger number of hand valves you see on a Coppus Steam Turbine promises you greater operating economy. At least 60% of the steam nozzles can be individually controlled to give maximum steam pressure in steam chest . . . a guarantee of best water rates at any load. Maintenance economy, too, is assured by the hard chromium plating of the shaft at the stuffing box. It provides the best possible smooth, non-corrosive surface for packing rings.

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- 2 row velocity-stage turbine wheel with stainless steel turbine buckets — statically and dynamically balanced
- 30-40 carbon steel shaft
- Oversized double row deep grooved ball bearing
- Stuffing box with metallic packing ring
- Heavy chrome plating of shaft through stuffing box
- 3 nozzles always open

Coppus Steam Turbines, Type TF, driving chemical transfer pumps at Celanese Corporation of America's Chemcel Plant

Coppus Steam Turbines ranging from 150 hp down to fractional in 6 frame sizes

MAKE TURBINE DOLLARS GO FARTHER

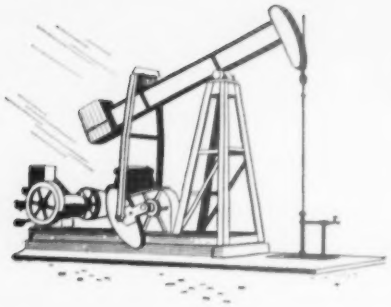
Why waste money buying turbines with higher horsepower ratings than you need? The higher the horsepower rating, the higher the price. Save money by selecting the Coppus Turbine size closest to your requirements from 150 hp down to fractional. And when you do, you save operating and maintenance costs, too. That's what these other Coppus features are designed to do: exclusive pilot operated excess speed safety trip supplementing constant speed governor; choice of metallic or carbon ring packing assemblies. Designs available for back pressures up to 75 pounds; replaceable cartridge type bearing housings. For full details . . .

WRITE FOR BULLETIN 135

COPPUS ENGINEERING CORP.,
271 Park Avenue, Worcester 2, Mass.

Sales offices in THOMAS' REGISTER.

COPPUS "BLUE RIBBON" TURBINES



When your production requires pumping or when you are replacing equipment to cut operating costs . . .

Precision-built Witte Oilfield Engines will give you constant, dependable pumping power for many years to come. These single cylinder, gas-gasoline models are of the horizontal, water-cooled, four-cycle type, and are equipped with condenser cooling, roller type main bearings, and removable wet cylinder liner for easy replacement in the field.

Model "B" Engines operate economically over a speed range of 450 to 900 rpm, developing 5 to 10 horsepower, while the Model "C" Engines have a speed range from 350 to 750 rpm and develop from 7.8 to 15.5 horsepower. The low engine speeds are largely responsible for the extra life of Witte Engines, and contribute greatly to their economy of operation.

See your favorite oilfield supply dealer about Witte Engines, soon.

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OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORPORATION
Kansas City 26, Mo.

WITTE ENGINES

USS

Gas-gasoline — Models from 4 to 15.5 hp

Full diesel — Models from 3.75 to 12.5 hp

UNITED STATES STEEL

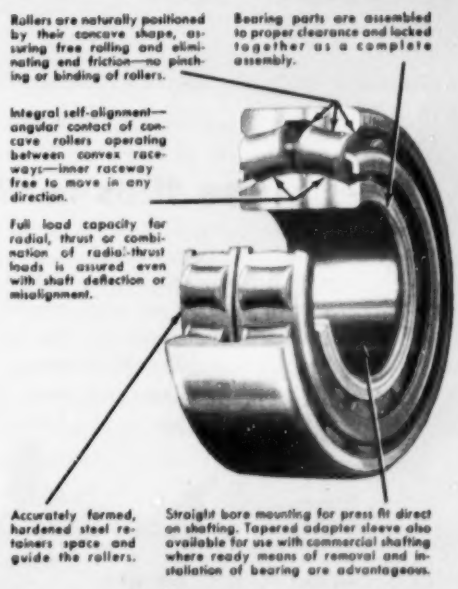
LINK-BELT Ball and Roller Bearings keep company with America's hardest-working equipment

The wrist pin bearings in this National E-11SB-57DW Pumping Unit are Link-Belt Double-Row Self-Aligning Roller Bearings. The beam rating of the unit in polished rod load is 11,000 pounds, and the wrist pin bearings are subject to a 57,000 inch-pound torque.

ANY bearing that can take the years of non-stop service a pumping unit demands—and still roll along efficiently—is the kind you want on your product. That's why so many manufacturers of oilfield machinery have standardized on Link-Belt Ball and Roller Bearings. They've learned from experience that these precision bearings give long life under the severe conditions encountered on pumping units and other types of hard-working oilfield equipment.

You can get complete information on the broad line of Link-Belt Ball and Roller Bearings from Data Book 2550. Write or call your nearest Link-Belt office today for your copy.

LINK-BELT COMPANY: Indianapolis 6, Dallas 1, Houston 1, Los Angeles 33, Kansas City 8, Mo., New York 7, Toronto 8. Distributors in all fields.


Rollers are naturally positioned by their concave shape, assuring free rolling and eliminating end friction—no pinching or binding of rollers.
Bearing parts are assembled to proper clearance and locked together as a complete assembly.
Integral self-alignment—angular contact of concave rollers operating between convex raceways—inner raceway free to move in any direction.
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Straight bore mounting for press fit direct on shafting. Tapered adapter sleeve also available for use with commercial shafting where ready means of removal and installation of bearing are advantageous.

Cutaway of Series DE Self-Aligning Roller Bearing—one of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-Up Blocks and Unmounted Bearings.

LINK-BELT

BALL AND ROLLER BEARINGS

13,220

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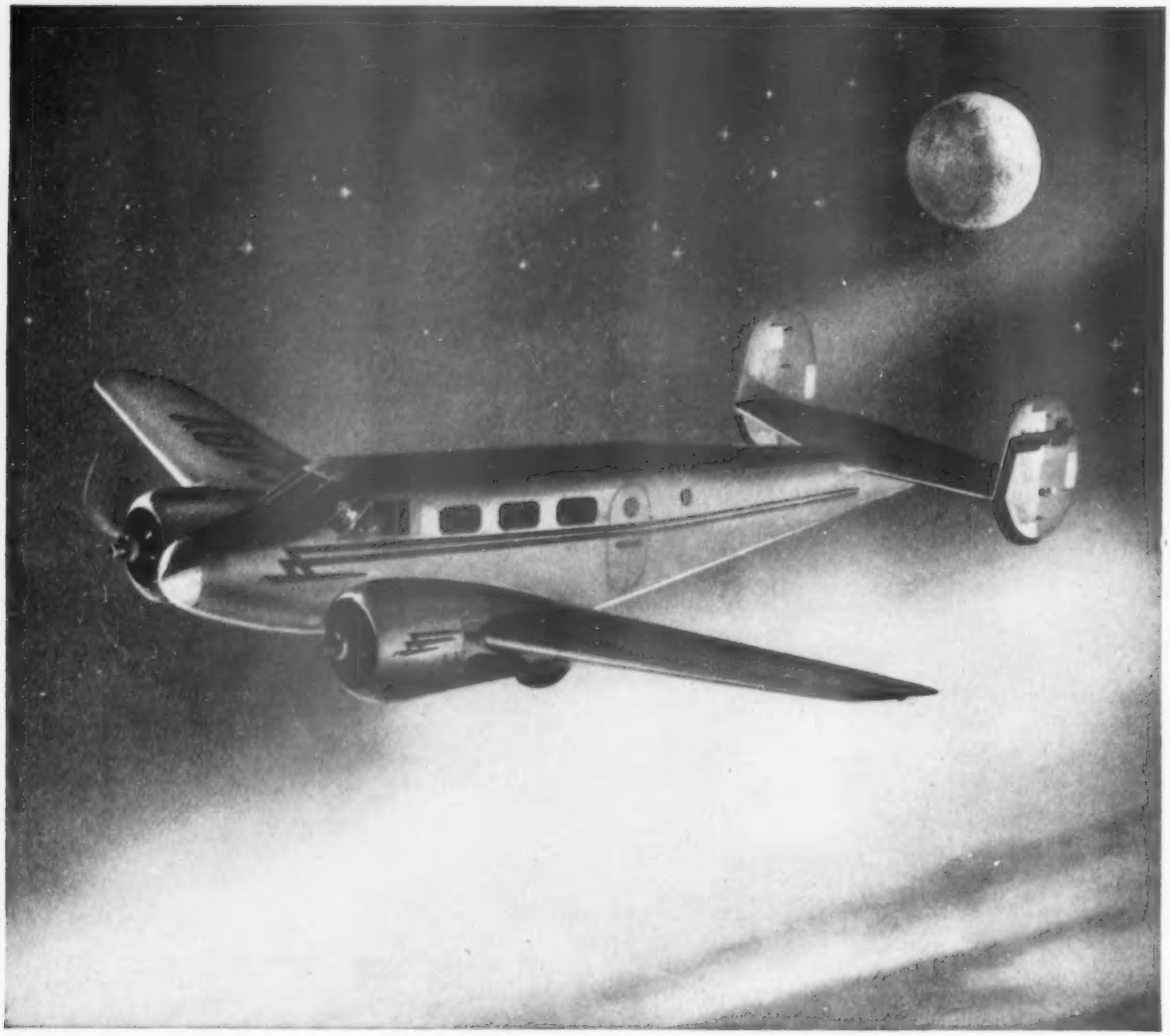

This plane flies to the moon and back . . every day

Hundreds of rugged, dependable Beechcraft "Twins" serve business all year long. It's estimated that these company-owned Beechcraft Executive Transports fly a combined distance equal to a trip to the moon and back every day.

Management men rely on this sound-proofed, superbly comfortable plane for the best of reasons: Its *use* saves them *money*, cuts travel-time as much as 75 per cent. These men take field trips they formerly "passed up"—coming and going at *their* convenience. They personally sell distant customers, solve problems on the spot. Investigate. Typical costs, operating data on request from your Beechcraft distributor or write Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

Royal Canadian Air Force Expeditor. Beech "Twins" will serve for pilot and navigation training, and communications work.

Beechcraft

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Ability to produce Cooling Towers...

. . . that's the talent of Jim Ashton, Plants Manager of the Marley Company. Like other Marley personnel, Mr. Ashton's "know-how" stems from years of experience in every phase of cooling tower production. From the ground up he knows design engineering, lumber prefabrication, mechanical equipment and metal fabrication as they pertain to cooling towers.

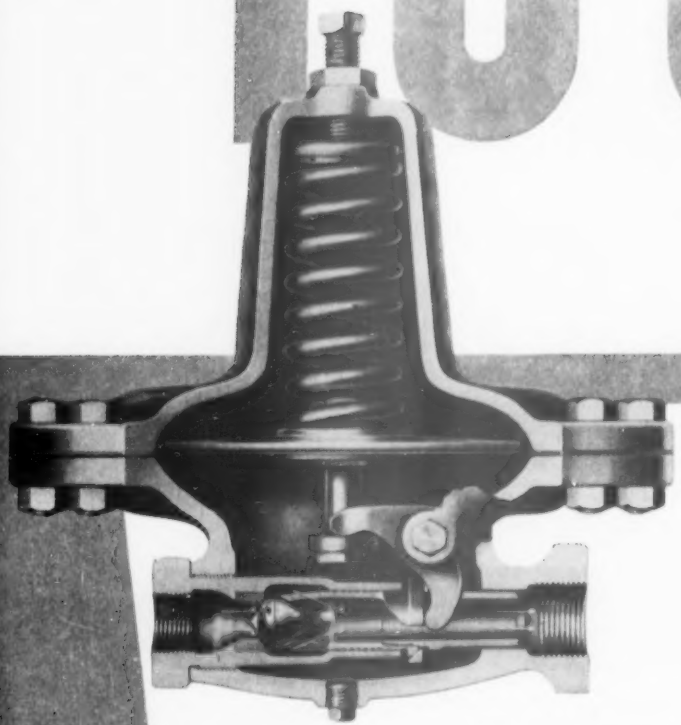
Ashton directs the world's largest, best equipped facilities devoted exclusively to the manufacture of cooling towers. These include: a 16-acre plant devoted to prefabrication of redwood . . . a plant where cooling tower mechanical equipment is produced . . . two plants where modern fabrication machinery and assembly-line techniques produce finished towers and prepare them for shipment.

This Marley "know-how" and "can-do" is your assurance that the tower you need will be manufactured to your exacting requirements in a minimum of time and delivered to the job site in orderly "packages" that make field erection fast and economical. These are major reasons why industry entrusts more of its cooling tower problems to Marley than to any other company.

The Marley Company

Kansas City, Missouri

TYPE 1000 VALVE



Any product of quality should be dependable when *ordinary* products fail. Sudden pressure fluctuations, dirt, scale and viscous matter prove "fatal" to ordinary pressure reducing valves.

The CASH STANDARD TYPE 1000 VALVE however, is designed to operate with complete dependability under the most difficult and unusual circumstances. Many of these units have been in service over 10 years and have never been taken "out of the line."

Truly an *EXTRAORDINARY* achievement of quality and design excellence.

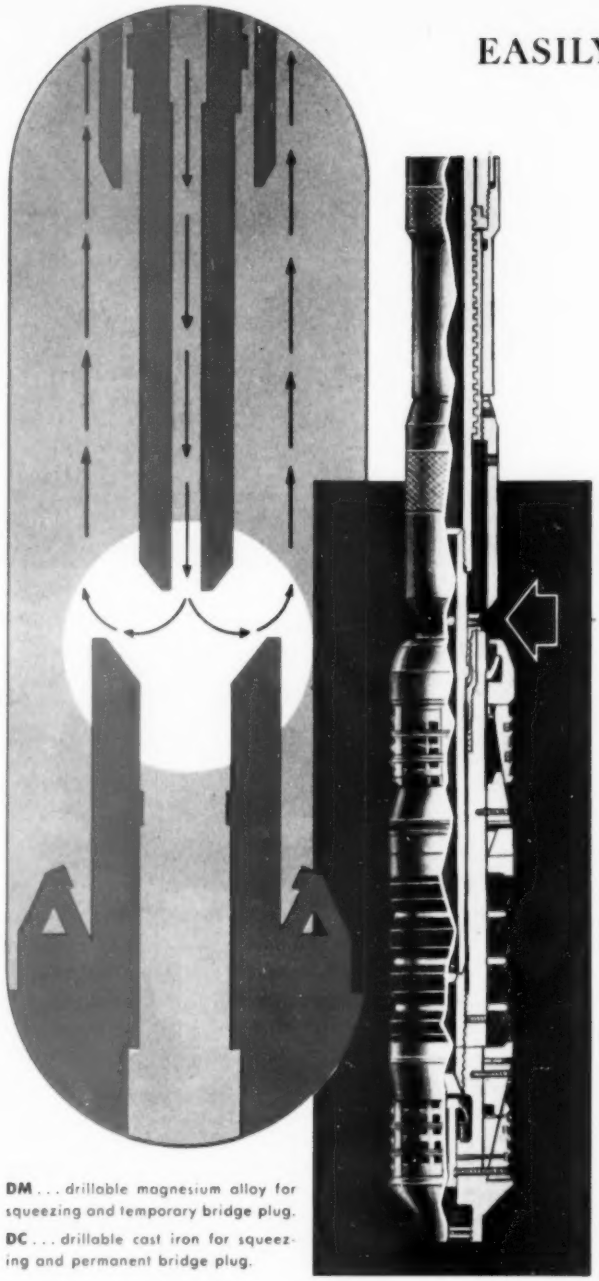
INSTALL CASH STANDARD "TYPE 1000" VALVES

CASH STANDARD **DECATUR, ILLINOIS**

A. W. CASH COMPANY

EASILY FREED AFTER SETTING...

HALLIBURTON'S DM AND DC SQUEEZE PACKERS



DM . . . drillable magnesium alloy for squeezing and temporary bridge plug.

DC . . . drillable cast iron for squeezing and permanent bridge plug.

There are no threads to unscrew or work loose from these Packers after cement has been placed. Tubing and circulating valve are freed easily – before squeezing begins.

Packers are set positively by a simple mechanical action, just rotating tubing to the right and picking up. Then, when the packing element has been expanded against the casing to form a perfect seal, *a continued upward lift on the tubing frees the circulating valve from the Packer*, and circulation can be established immediately.

These famous precision-made Squeeze Packers incorporate additonal top engineering features that set them apart from average squeeze tools. For example, the exclusive Halliburton circulating valve contains no ports to clog, allowing uninterrupted free circulation in either direction. And no strain is taken on tubing during squeezing, which decreases stress and reduces the danger of damaging tubing by internal pressure.

Engineered for application in any well, these Packers provide successful squeeze cementing at the desired points. Next time, call for these dependable Squeeze Packers. Just phone your nearby Halliburton representative. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

YEARS AHEAD IN SQUEEZE CEMENTING!

HALLIBURTON

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Specify National's IDEAL Power Slush Pumps

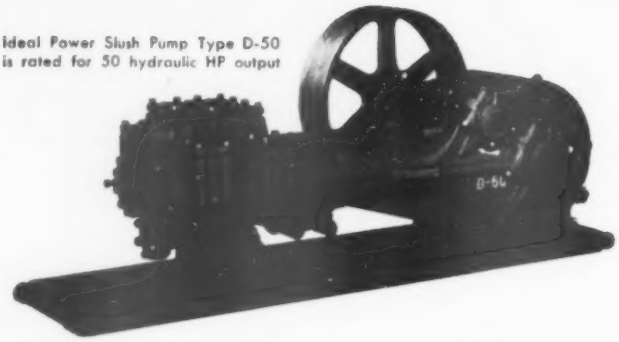
National Supply's 40-year history and experience in mud pump design and manufacture is important to you, as a user, because it means that all field-tested improvements become part of Ideal Slush Pump design and construction.

Through its world-wide staff of field engineers and product engineers, National Supply is constantly kept posted on changes in drilling mud requirements and mud pump performance in virtually every field. Such daily facts and figures motivate the constant improvement of Ideal Power Slush Pumps to assure modern quality and performance.

To suit virtually every drilling job, including jet bit drilling, Ideal Power Slush Pumps are manufactured in a complete range of sizes from 50 to 700 hydraulic horsepower output.

Be sure to have the latest facts on improvements in Ideal Power Slush Pumps—ask for recently published bulletins at the nearby National Supply Store or from the National Supply Representative in your area.

Ideal Power Slush Pump Type D-50 is rated for 50 hydraulic HP output

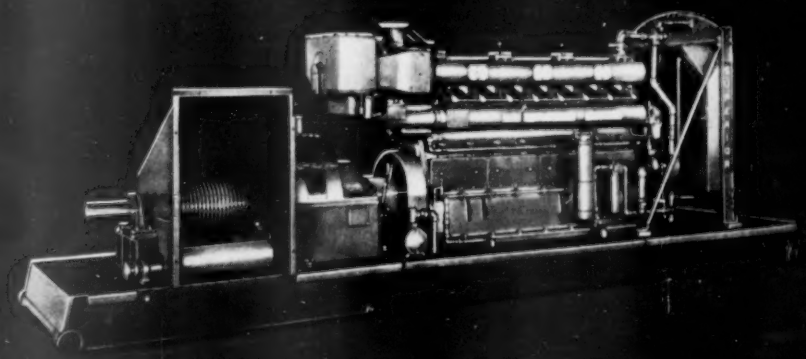


Ideal Power Slush Pump Type E-700 is rated for 700 hydraulic HP output

AND TO GET MAXIMUM PERFORMANCE OUT OF YOUR PRESENT MUD PUMPS USE IDEAL FLUID END PARTS

Ideal Fluid End Parts will enable you to realize the full benefits of preventive maintenance programs for lower pump operating costs. Precision-made under National Supply's strict manufacturing standards, Ideal Fluid End Parts give exceptionally long service life under varying slush pump operations.

Whenever you're ordering, look for the bright blue and yellow label of quality which marks the specially-packaged Ideal Fluid End Parts. You'll find them stocked at all National Supply Stores throughout the United States and Canada.



MUD PUMP PERFORMANCE

and IDEAL Independent Pump Drives

When drillers need increased fluid volume and velocity for the utmost in operating flexibility, Ideal Independent Pump Drives are recommended.

Sectionalized in the same manner as Ideal Consolidated Rigs and Drive Groups for mobility in the field, Ideal Independent Pump Drives are made in both single and dual engine types for the complete range of Ideal Pumps.

Completely flexible in applications, Ideal Independent Pump Drives feature—

- In-line and 90° angle drive.
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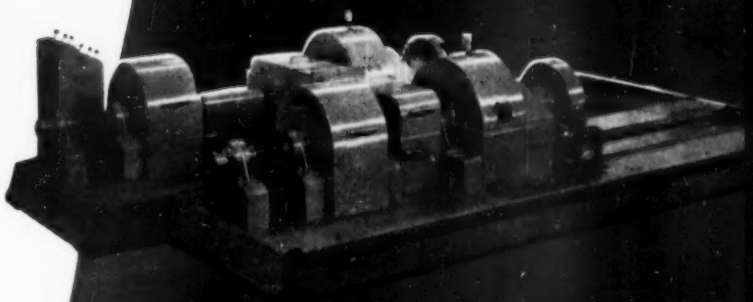
- Dual-pump, dual engine combinations arranged for separate or tandem pump operation with one or two engines.

You'll find complete basic information on Ideal Independent Pump Drives in the Composite Catalog. For application details to meet specific requirements, contact any National Supply store.



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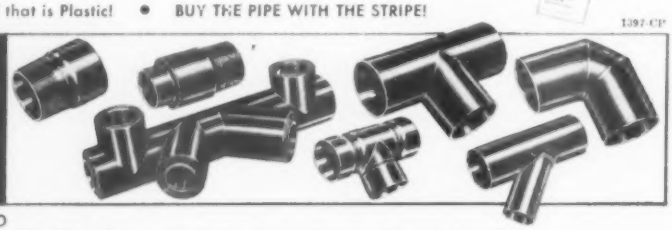
Pioneers in Plastic Pipe



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CARLON plastic pipe is produced in Texas, Colorado, Ohio, Oregon, North Carolina and Acton, Ontario, Canada.

Dependability YOU CAN TAKE FOR GRANTED

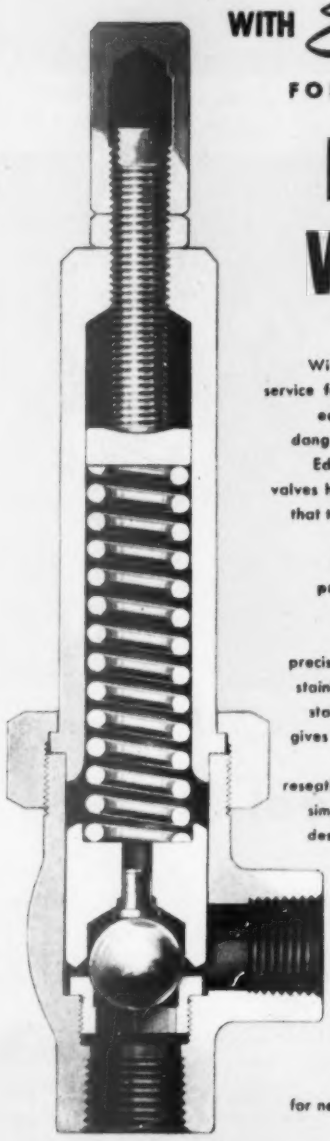
PROTECT

EQUIPMENT AGAINST DANGEROUS PRESSURE INCREASES

WITH *Edward*

FORGED STEEL

RELIEF VALVES



Widely used in all types of service for protecting plant and equipment against sudden dangerous pressure increases, Edward forged steel relief valves have repeatedly proved that they will always perform their relieving action dependably and at the pressure for which they are set.

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PREVENT

DAMAGE TO VITAL INSTRUMENTS BY USING

Edward STRAINERS

Traps, pumps, valves, pressure and temperature regulators and gages will operate more efficiently and last far longer when Edward forged steel strainers remove grit, scale and other foreign matter from pipe lines. They are easy as possible to clean. Working parts are as few as possible:

1. Forged steel body with streamlined inner contours for free flow and minimum pressure drop.
2. Rust proof monel metal perforated screen built to withstand severe abrasive service, precision-fitted to prevent leakage of foreign matter.
3. Steel union ring and bonnet make tight connection with body and hold screen firmly in place. Drain plug easily removed to clean out accumulated matter.

For steam, oil or vapor service up to 600 lb at 850 F or for hydraulic service up to 1440 lb, Edward strainers may be installed in either horizontal or vertical lines. Write for new Bulletin No. 712 on Edward strainers.

Edward Valves, Inc.

Subsidiary of Rockwell Manufacturing Co., East Chicago, Indiana

EDWARD VALVES, Inc.
1492 West 145th Street, East Chicago, Ind.
Please send me the new bulletins on Edward strainers ☐, relief valves ☐

Name _____

Company _____

Street _____

City _____ Zone ____ State _____

Making circumferential weld on 36-in. Bethlehem Pipe near Hammond, Ind., installed by Northern Indiana Public Service Company.

Three 40-ft lengths of Bethlehem Pipe, welded end to end, being positioned in 2½-mi line near Chicago. Pipe diameter is 22 in.

Bethlehem 26-in. pipe goes into ditch at Granite, Md., in 15-mi pipeline for Consolidated Gas Electric Light & Power Co., Baltimore.

Welder makes field girth seam on Bethlehem 24-in. pipe. This installation located near Alton, Ill., for Mississippi River Fuel Corp.

They're all built with Steel Pipe

Here are pictures of recent construction on four separate gas pipelines in various parts of the country. Each line was built with Bethlehem Oil and Gas Pipe, the steel pipe with the great beam strength.

Bethlehem Oil and Gas Pipe is ideal for gas distribution lines, not only because of its strength, but because it is so sound and economical. It's a quality pipe through and through, and it is relatively easy to string and install. It can be made to meet the requirements of any of these specifications: API Lx42, ASTM A-139, and ASTM A-134.

Bethlehem Oil and Gas Pipe is furnished with beveled or straight ends, and is generally made in 40-ft lengths. It comes in diameters 22 in. i.d. and greater, and in thicknesses to accommodate any working pressure. For full details, please get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

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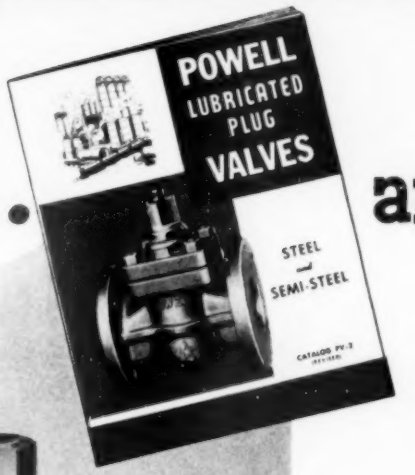
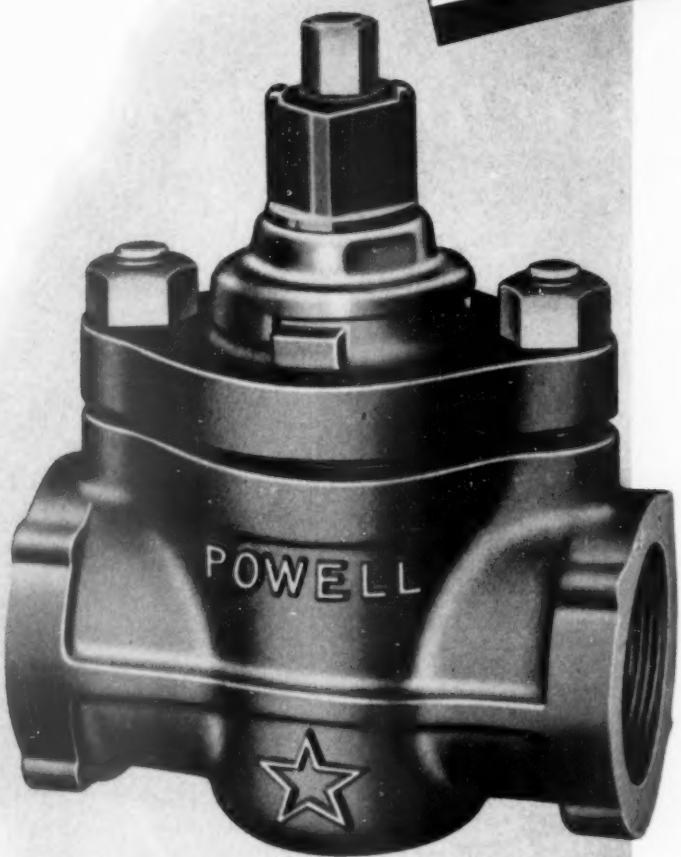
BETHLEHEM STEEL

BETHLEHEM OIL AND GAS PIPE

New... and too good to miss!





Now, for the first time, lubricated plug valves that carry the Powell name and measure up to the Powell standards of precision are available in Semi-Steel and Carbon Steel.

You'll want the new PV-2 Catalog in your files. In fact, no valve file can be considered complete without it. And it's so easy to get. Just fill out the coupon below and mail. No charge, no obligation.

As you page through the catalog, you'll see the details that maintain these great new valves in the century-young Powell tradition. Features include quick and positive operation—just a quarter-turn of the Lubricated Tapered Plug to open or close. Lubricant grooves surrounding each port provide a positive seal when the valve is closed. In an open position, seating surfaces are not exposed.

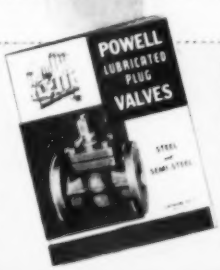
Powell Lubricated Plug Valves are available with Screwed or Bolted Glands. Semi-Steel Valves are available for 175 and 200 pounds W.O.G. Carbon Steel Valves are available for 150 and 300 pounds W.P.

Powell Valves

THE WM. POWELL COMPANY • DEPENDABLE VALVES SINCE 1846 • CINCINNATI 22, OHIO

Free! SEND FOR THE PV-2 CATALOG TODAY

... it's too good to miss!



THE WM. POWELL COMPANY
2501 SPRING GROVE AVE., CINCINNATI 22, OHIO

Gentlemen:

I want to bring my valve file up to date. Please send me a copy of your PV-2 Catalog on Powell Lubricated Plug Valves.

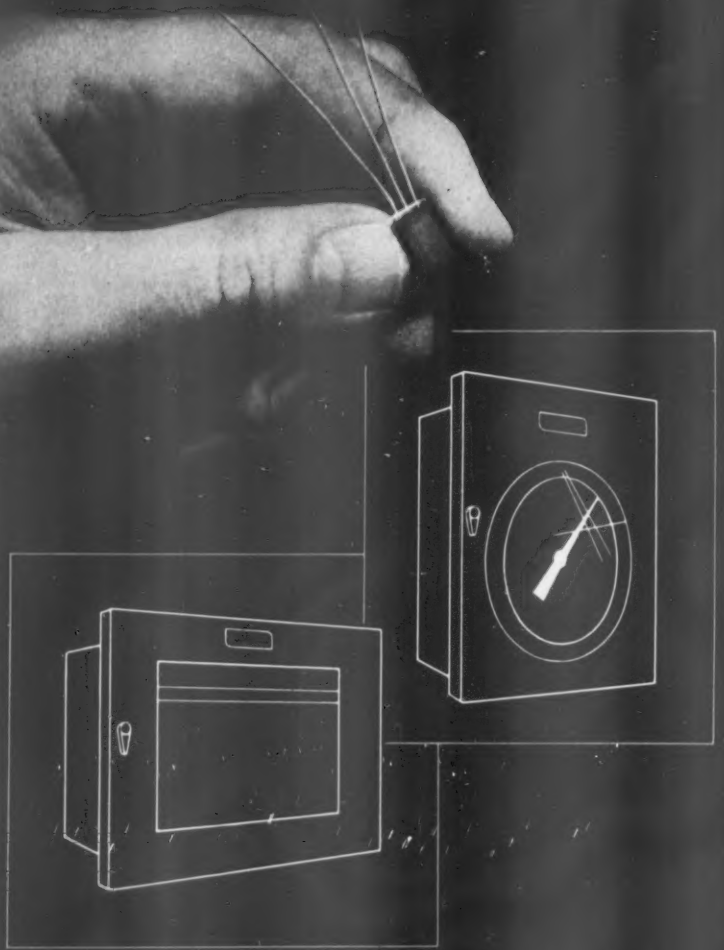
NAME_____ TITLE_____

COMPANY_____

CITY_____ ZONE____ STATE_____

Transistors*

in instrumentation...



*Transistors are capsule-size assemblies which utilize the physics of semi-conducting solids to produce the same effects as an electronic tube . . . but without cathode and/or filament and their circuitry components.

When ?

A timely statement from Walter P. Wills,
Director of Research, Brown Instruments Division
Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.

"PERHAPS you've wondered when transistors, with their widely publicized characteristics, will be put to work in industrial instrumentation. Naturally, I can speak only for my company, but I'd like to give you a research man's view on where transistors stand today.

"We agree that transistors have a tremendous future in all of electronics, including automatic control. Many problems, however, must yet be solved. Will they be made of germanium or silicon? Can they be made more reproducible and able to handle enough power at desired voltages? New circuits and new transistor types are needed. Today's costs are much too high. And let's not forget that the vacuum tube is still being developed after more than 40 years of existence.

"Even with extensive research and development programs, much more work remains before transistors can be broadly utilized in their natural markets—radio, television, and other communication equipment. Similarly, the few types now available do not nearly satisfy the requirements of industrial instrumentation.

"A 'tubeless' electronic instrument is theoretically possible today, and, on the basis of safety and reliability expected of modern instruments, it is anticipated that such a product is completely possible and practical in the future.

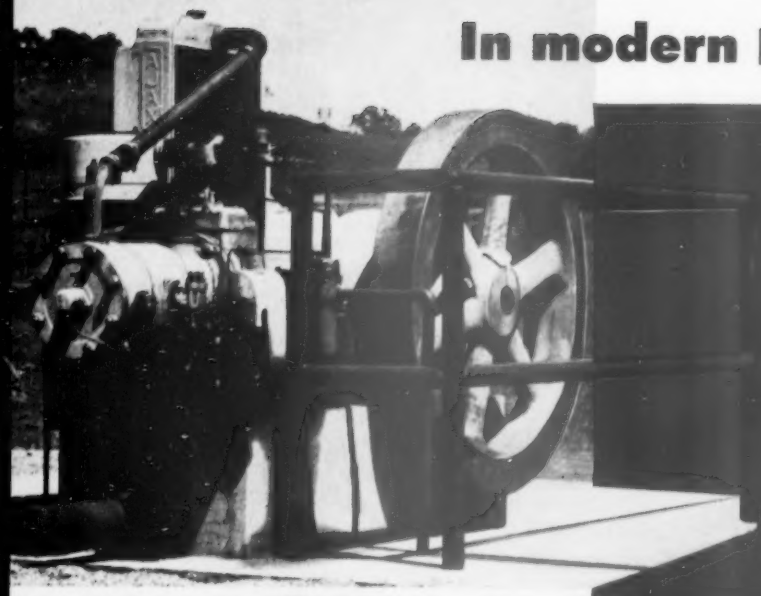
"So we're attacking the problem on a broad front. For upwards of five years, we've been devoting a large portion of our research facilities to studying ways to utilize transistors . . . looking on them not solely as replacements for tubes, but as the starting point for totally new instrument circuits.

"In addition, we have invested in the patent licenses and the know-how of Bell Telephone Laboratories, the pioneer of transistors. We have a large stake in providing instrumentation for the manufacture of transistors and hence are examining all facets of the transistor business . . . even to the extent of making some with our own hands.

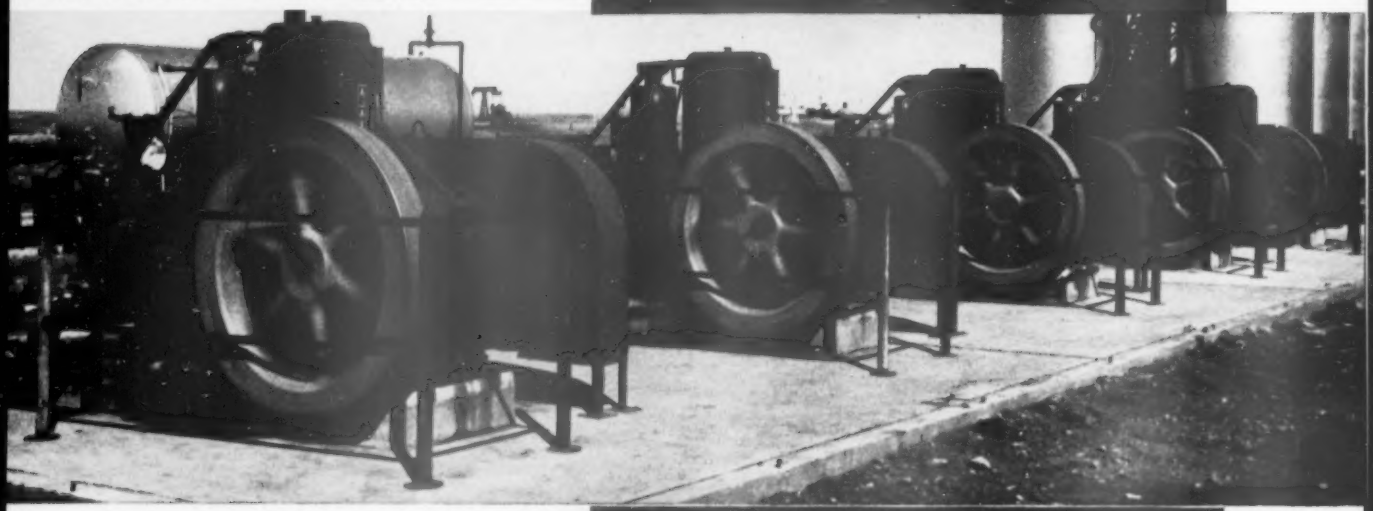
"Honeywell instruments and other Honeywell controls using transistors will be on the market. When they are, you can be sure they will be great products—new, but the same kind of reliable, versatile, well-engineered products we sell today."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

In modern Fluid Injection . . .



AJAX gets the call!



In the vital, expanding field of secondary recovery and pressure maintenance by fluid injection, Ajax Engines lead. The powerful DP-70 Model 11 x 14 shown above is the popular choice for economical, always dependable performance. Ask your Supply Man to detail the very good reasons-why!

AJAX

AJAX ENGINES

Gas and Oil Engines

PESA

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PARTNERS IN PETROLEUM PROGRESS

AJAX IRON WORKS

Builders of Gas Engines • Steam Drilling Engines • Industrial Steam Engines

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.

R. B. MOORE SUPPLY CO., BOLIVAR, N.Y. • BETHLEHEM SUPPLY CO., TULSA, OKLA.

PETROLEUM CHEMICALS DIVISION

NEWS

October ★ One of a Series of Interest to the Petroleum Industry ★ 1953

A Million $ a Week for Research

Du Pont spent $52,000,000 for its research program last year. And this sum was exclusive of construction costs for new research facilities.

In spite of its high cost, the Du Pont Company believes research offers the best assurance for long-range job security. New job opportunities are created through the new products it develops.

It also helps to create new market opportunities for many basic raw materials. Petrochemicals are an outstanding example of this and Du Pont buys increasingly larger quantities of them every year.

Du Pont Research Program to Help Refiners Solve Pre-Ignition Problems

Pre-ignition during road operation is a definite obstacle to further improvement in the efficiency of fuel utilization in gasoline engines.

The development of higher compression engines makes the need for a solution to this problem—which possibly exceeds knock in importance—all the more pressing. With the aim of helping refiners overcome pre-ignition through the use of additives, the Du Pont Petroleum Laboratory has already done extensive research.

The laboratory has found that the two most important aspects of the problem are: (1) the tendencies of combustion chamber deposits to glow and cause surface ignition of the charge; and (2) the ability of fuels to withstand ignition by hot surfaces.

Deposit glow can be minimized by certain fuel additives. With future higher compression ratio engines it may also be necessary to improve the ability of fuels to withstand hot surface ignition.

EFFECTIVENESS OF TEL

Glowing deposits, principally those flaky in nature, act as igniters and some hydrocarbons are more sensitive to ignition by these hot deposit particles than others.

However, by raising the octane rating as for example *with tetraethyl lead, the pre-ignition tendency of the gasoline is reduced.*

"Magic Barrel"

40 OUTSTANDING PRODUCTS DERIVED FROM PETROLEUM MAKE UNIQUE PUBLIC RELATIONS PRESENTATION

The "Magic Barrel" *looks* like a 55-gallon oil drum.

But, instead of crude oil, the drum contains a wide variety of *finished* products made from petroleum . . . products used every day in the home, on the farm, in industry and on the highways. All of these have been woven into a unique presentation that shows the tremendous importance of petroleum in our daily living.

PETROLEUM is the important ingredient in all the products shown in this "Magic Barrel" display. Mounted on semi-circular trays, the whole display is built up out of the oil drum in the center.

The display and the talk accompanying it were put together by the Du Pont Petroleum Chemicals Division. The show was designed, however, to be used by oil industry representatives, as a public relations presentation. It is both entertaining and educational. As such it is ideally suited for showings to schools and colleges, civic organizations and luncheon clubs, as well as to employee and customer groups.

More complete details on these investigations by the Du Pont Petroleum Laboratory can be obtained from any Du Pont Petroleum Chemicals Division district office. Ask for papers entitled "Pre-Ignition in Automotive Engines" and "An Investigation of Pre-Ignition in Engines."

FLEXIBLE PROGRAM

The speaker builds his theme of "better living from petroleum products" by displaying and demonstrating the many interesting products found in the barrel. The talk is extremely elastic and can be done in 30 minutes or extended to an hour.

The barrel itself is made of aluminum and split lengthwise into two sections. These are hinged together so that the drum can be opened and used as a lectern by the speaker. There are 16 removable shelves inside the barrel. Each holds a small display of related products. Products can be changed or added at the will of the speaker.

3 BASIC NEEDS

The presentation covers the three es-

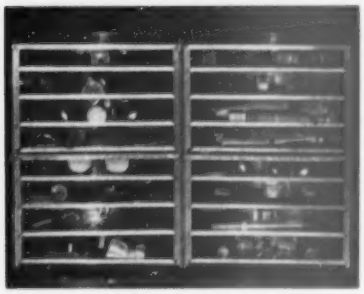
OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *"Magic Barrel"*

sential needs for living: food, clothing and shelter. Protective wrappers, refrigerants, insecticides and weed killers, for example, are all important to food production and distribution.



INSIDE THE "MAGIC BARREL," the trays of products are compactly arranged for convenient shipping.

Synthetic fibers, of course, play an important role in our modern clothing industry. And there are numerous plastics, paints, upholsteries, brushes and

MAKING SYNTHETIC RUBBER right on top of the barrel adds a unique touch of showmanship to the presentation.

other products made from petroleum which are used every day in the home and are included in the display.

The "Magic Barrel" is even a *factory* for making synthetic rubber. Starting with a liquid polymer, rubber balls are produced in a matter of seconds. These are tossed out to the audience as souvenirs.

AVAILABLE TO YOU

If you would like to make use of this presentation in your own public relations program, just get in touch with the nearest Du Pont Petroleum Chemicals Division district office.

Sales-Service Representative

ARTHUR C. SANTORA joined the Du Pont Company in 1950 as a sales-service representative of the Petroleum Chemicals Division's eastern district.

His association with the petroleum industry began in 1943 as a research engineer for the Standard Oil Development Company. During the next seven years his work included research on polymerization, hydrocarbon synthesis, inhibitors, aviation gasoline and a wide variety of petroleum refining problems.

A graduate of Union College with a B.S. in chemistry, Mr. Santora received his M.S. in physics from Cornell in 1940 and his Ph.D. in organic chemistry from the University of North Carolina in 1943. He has also taught mathematics, mechanics and analytical chemistry.

He is a member of the American Chemical Society and the Society of Automotive Engineers.

ARTHUR C. SANTORA

Additive to Improve Diesel Fuels

Du Pont Fuel Oil Additive No. 2, originally developed as a stabilizer and dispersant for distillate fuel oils used in domestic oil burners, also offers a number of advantages to diesel fuel refiners.

Being ashless, it leaves no combustion chamber deposits to cause operating difficulties.

To help refiners gain added flexibility and capacity in diesel fuel production, Fuel Oil Additive No. 2 enables them to blend cat-cracked and straight-run stocks. This additive also allows a certain amount of heavy oil to be blended in the diesel fuel without giving undue difficulties with filterability. In this way, it enables refiners to upgrade their heavy fuel oils.

To prevent clogging of diesel filter screens, Fuel Oil Additive No. 2 not only retards the formation of insoluble residues, but also reduces the particle size of those insoluble residues that are formed.

Storage tests show that in all cases Fuel Oil Additive No. 2 gives best results when added at the refinery to freshly prepared stocks.

LITERATURE AVAILABLE

Here is a partial listing of the bulletins, reports, booklets, technical papers and aids available to you through any of the Du Pont Petroleum Chemicals Division district offices listed below:

Pre-Ignition in Automotive Engines—This paper discusses mainly the glowing tendencies of combustion chamber deposits and the pre-ignition tendencies of individual hydrocarbons . . . . . Serial A-5652

An Investigation of Pre-Ignition in Engines—A comprehensive discussion of how compression ratios and other mechanical factors affect pre-ignition. Also the effect of tetraethyl lead in reducing pre-ignition . . . . . Serial A-5756

Du Pont Fuel Oil Additive No. 2—A 12-page bulletin describing this ashless stabilizer and dispersant which prevents clogging of fuel oil screens . . Serial A-5201

DU PONT
REG. U.S. PAT. OFF.
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

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CHICAGO, ILL.—8 So. Michigan Blvd.	Phone RAndolph 6-8630
TULSA, OKLA.—1811 So. Baltimore Avenue	Phone Tulsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg.	Phone PReston 2857
LOS ANGELES, CALIF.—612 So. Flower St.	Phone MAdison 1691

IN CANADA: Canadian Industries Limited—Toronto, Ont.—Montreal, Que.—Calgary, Alta.
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Bldg., 6539—Wilmington 98, Del.

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A-6108

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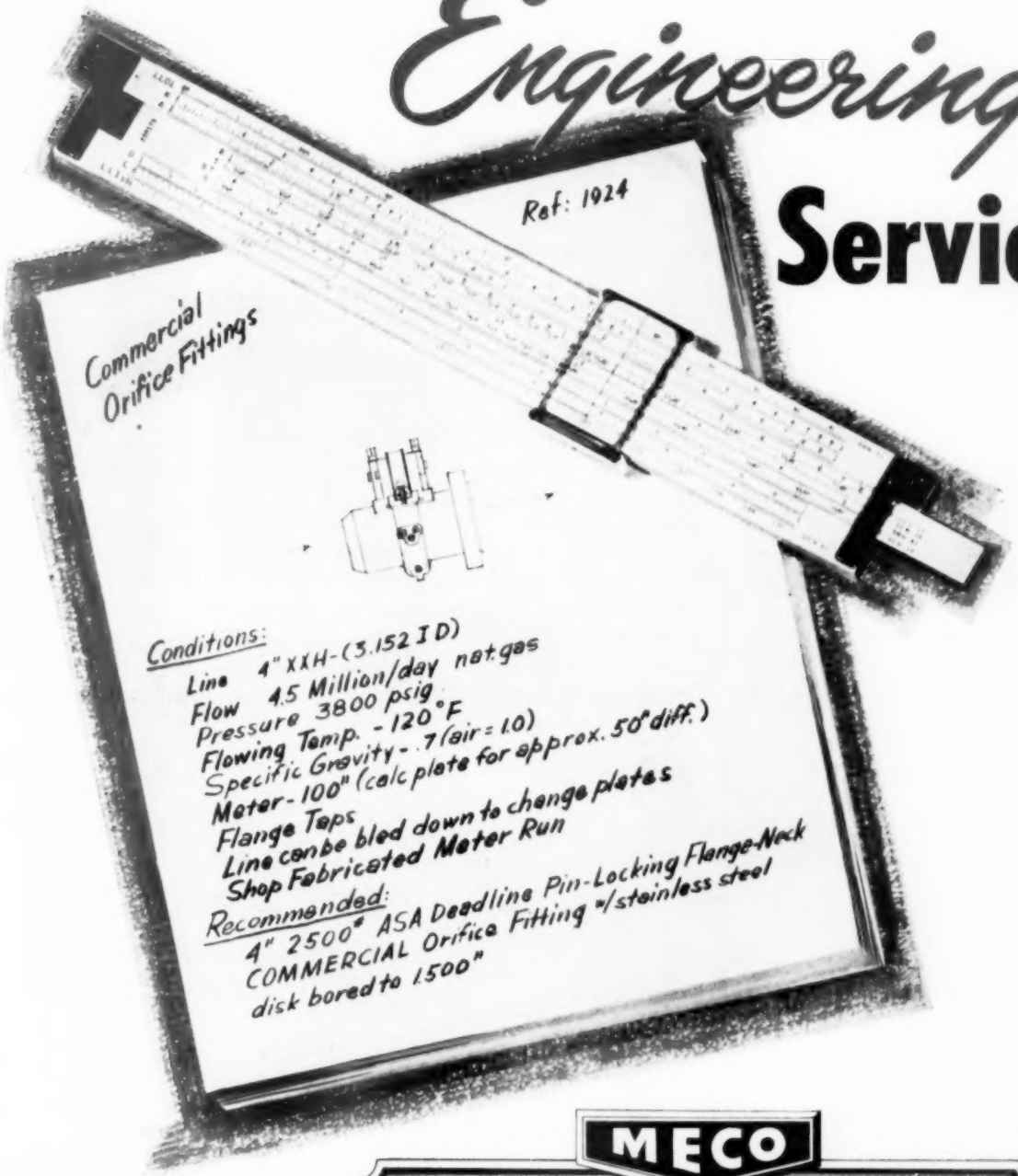
Equipment with *Engineering* Service


Ref: 1924
Commercial Orifice Fittings
Conditions:
Line 4" XXH-(3.152 I D)
Flow 4.5 Million/day nat.gas
Pressure 3800 psig
Flowing Temp. - 120°F
Specific Gravity - .7 (air = 1.0)
Meter - 100" (calc plate for approx. 50" diff.)
Flange Taps
Line can be bled down to change plates
Shop Fabricated Meter Run
Recommended:
4" 2500# ASA Deadline Pin-Locking Flange-Neck
COMMERCIAL Orifice Fitting w/stainless steel
disk bored to 1500"

MECO

MAINTENANCE *Engineering* **CORPORATION**

P. O. BOX 2637

3711 CLINTON DRIVE
HOUSTON, TEXAS

Neoprene Latex Clothing

Protective Clothing

HERE'S PROTECTION

"Strength without Bulk"

for Refinery and Oil Field Workers — against oils, greases, acids and alkalis!

Made of Neoprene Latex, these AO garments are *saturation-coated* for long life. They won't peel, blister or crack yet they're lightweight, contain no heavy "loaders". Highly flexible, they won't stiffen in cold weather or become sticky in hot. They are easy to clean — tub 'em, scrub 'em or clean them with petroleum solvent — AO Neoprene Latex Clothing can take it. Illustrated and described are three of the nine garments in the line. Yellow is the most popular color for *safety*, but black is also available on special order.
In addition to the items illustrated, AO offers Coveralls, Police coats and All-weather Hoods.

902 SUIT JACKET — Has button fasteners, storm front and corduroy collar. 30″ long from collar to tail. No seam in back.

913 PANTS — Over-all bib type pants with cross-back suspender straps having bar fasteners that attach to two buttons at top of the bib. Safety fly front featuring an overlap which prevents entrance of oils or chemicals or other liquids. Waist type pants are also available.

Your nearest AO Safety Products Representative can supply you

901 COAT — ¾ length (44″) all sizes. Two side pockets with an overlapping storm front and button fasteners. Standing corduroy-lined collar. No vent or slit in tail of coat. Long coats 50″ — 54″ are also available. 922 Sou'wester type hats in all sizes.

Look to AO for a complete line of safety goggles, protective clothing and respirators for every industrial need.

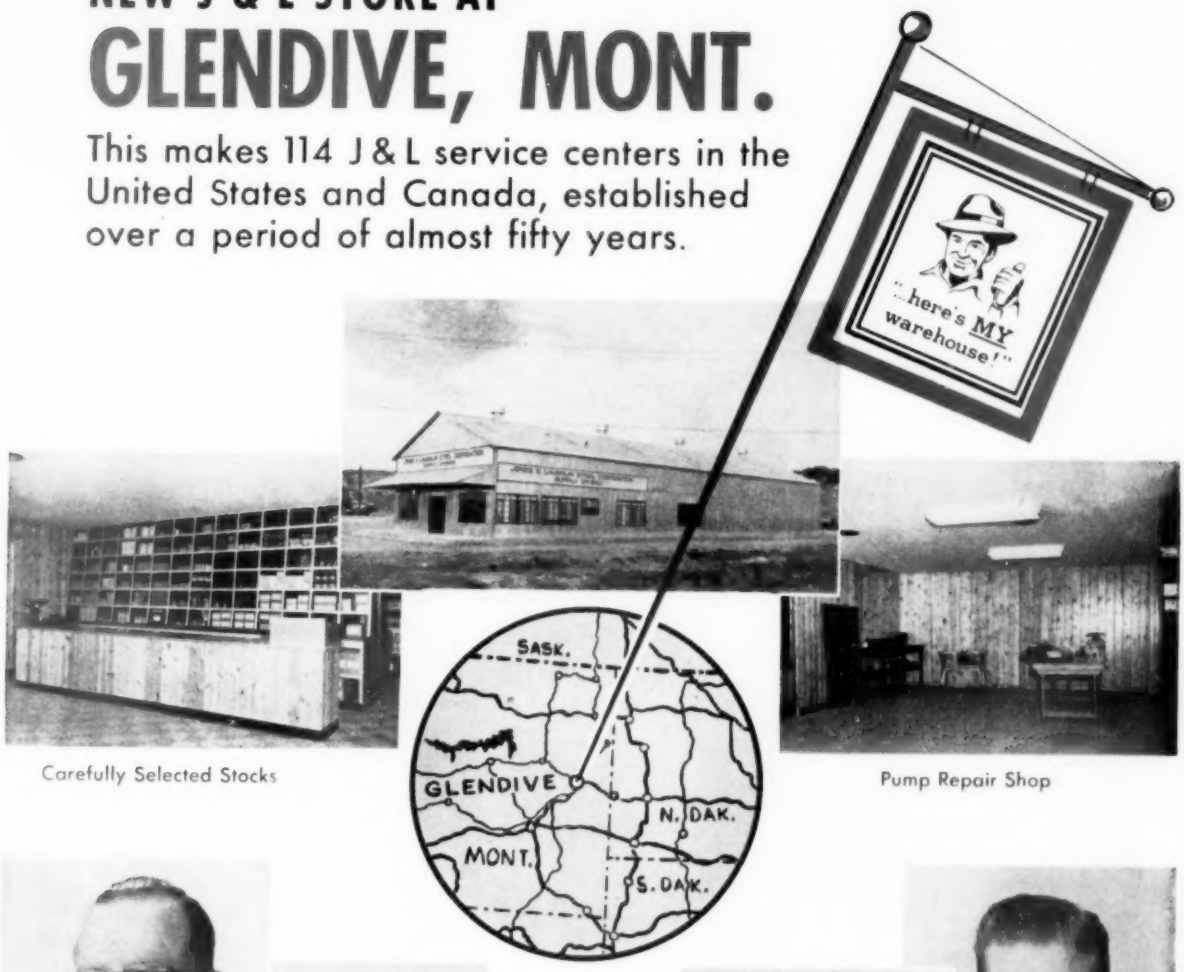
American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

NEW J & L STORE AT
GLENDIVE, MONT.

This makes 114 J & L service centers in the United States and Canada, established over a period of almost fifty years.



Carefully Selected Stocks

Pump Repair Shop

M. A. Park,
District Sales Mgr.,
Northern Rocky
Mountain District

Cecil J. Kriewitz,
Glendive Store Mgr.

Orville K. Taylor,
Storeman

Nolan E. Cannon,
Storeman

Carl H. Kellogg,
Field Salesman

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION
SUPPLY DIVISION

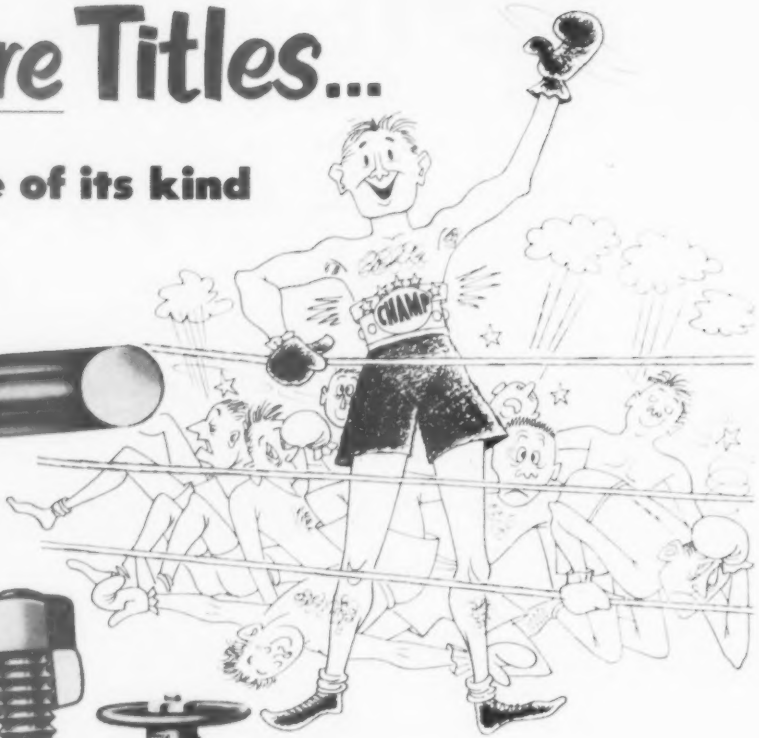
PESA

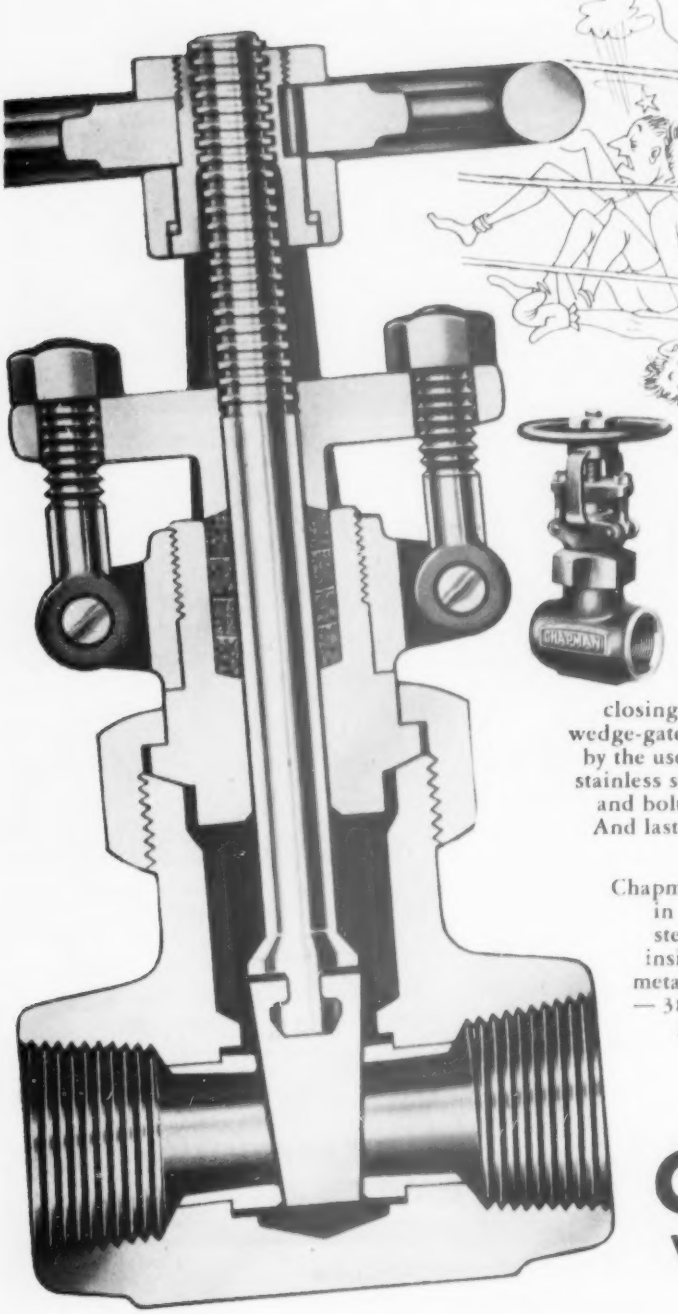
General Offices: TULSA, OKLAHOMA
87 STORES • 19 OFFICES • 8 RESIDENT SALESMEN

CHAPMAN LIST 960

Holds More Titles...

than any valve of its kind





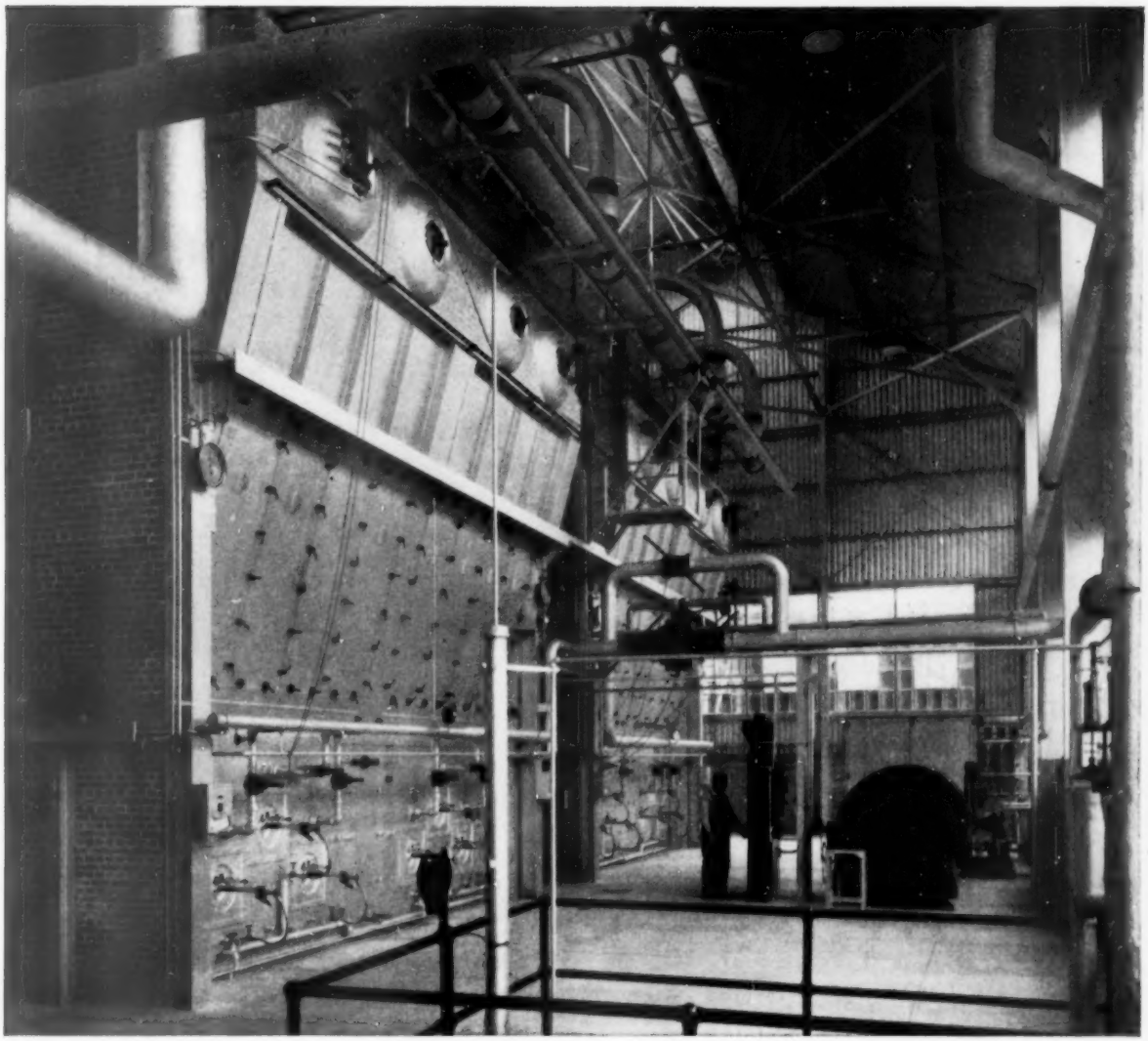
Yes, here's the champ of all small forged steel gate valves! It has licked more different jobs than you can shake a stick at . . . and stays in there fighting with all the *extra stamina* you get in *every* Chapman Valve.

Here are the reasons why: Extra protection against even unusual stress when opening and closing the valve is provided by extra-strong stem-and-wedge-gate connection. Repairs and replacements are cut by the use of super-hardened seat rings and gate faces of stainless steel. Forged body and yoke are longer-lived . . . and bolted follower has no threads on yoke to corrode. And lastly, gate faces won't seize or gall because they're *Malcomized* (Chapman patent) to 800 Brinell.

Chapman List 960 Forged Steel Gate Valves are made in sizes from ½" to 2" inclusive . . . with rising stem with yoke (shown) or with rising stem with inside screw. Bonnet joints are either gasketed or metal to metal. Pressure range: 2,000 lb. at 100° F. — 380 lb. at 1,000° F. For higher pressures, specify List 990. And for full details on List 960, send today for your copy of Catalog 10.

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASS.



How to brighten dark rooms with just one coat of paint

When you consider labor costs on a job like this, you soon realize that it's only good business to use the best quality paint. Particularly when an aluminum paint formulated to your specific needs may well save you the cost of a second coat.

While Alcoa does not make paint, it's our business to know all about the aluminum pigments that go into the best brands. We supply most of them. Working together, Alcoa technicians and leading paint manufacturers have found ways to combine pigments and vehicles for the utmost protection against the most common industrial paint problems—heat, cold, dirt, moisture, smoke, fumes and corrosive action.

If there's a spot that needs brightening in your plant—or a smokestack, tank, boiler or other equipment that deserves preserving—find out how far a brushful of the *right* aluminum paint will go, *how long it will last.*

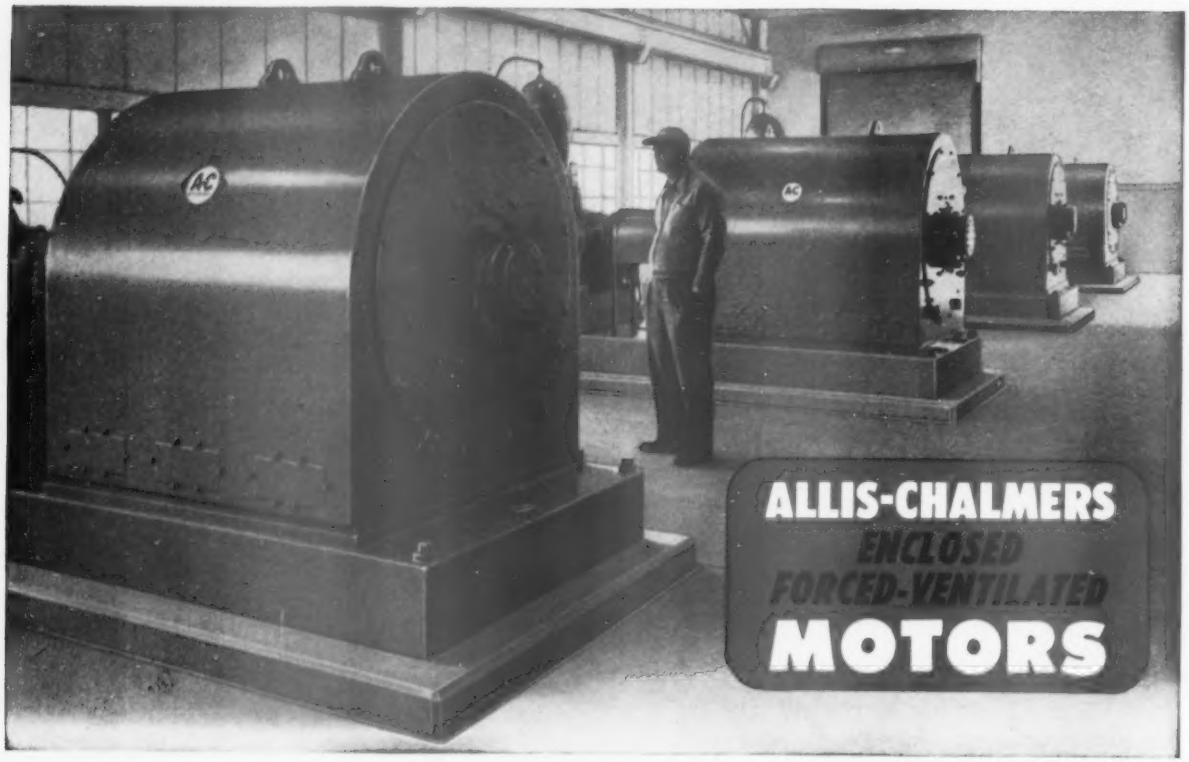
Ask your paint supplier about specially formulated aluminum paints made with Alcoa® Albron Pigments. Or tell us your problems. We'll gladly recommend the correct type of aluminum paint for your job.

For a free copy of our 32-page booklet, *Painting with Aluminum*, just call your local Alcoa sales office or write: Paint Service Bureau, Aluminum Company of America, 1791-K Alcoa Building, Pittsburgh 19, Pennsylvania.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

Sinclair Selects...



Sinclair Pipe Line Company's new 670-mile, 24 and 22-inch line stretches from Cushing, Oklahoma, to East Chicago, Indiana. Ultimate capacity ranges from 280,000 bbl a day for the 24-inch portion of the line to 210,000 bbl a day for the 22-inch portion.

Pictured above are the 900-hp and three 1750-hp, 1800-rpm squirrel-cage motors at Humboldt, Kansas.

Below is a 1250-hp motor for one of the more northeasterly stations. This view shows the cover-plate arrangement used to permit internal lead connections and eliminate the need for terminal boxes.

All seven stations on new big-inch crude oil line are powered by Allis-Chalmers motors

MORE AND MORE of these forced-ventilated motors are being installed in oil and gas pipe-line stations. Used with a common ventilating system they provide these advantages:

- They cost very little more than open motors.
- Protection for hazardous locations is provided by supplying the ventilating air under pressure — during starting and during operation.
- Maintenance is minimized because the motors operate in cool, clean air.
- Motors are designed for the installation. They can, for example, be built for base, side or top air ducts.
- Design details assure easy, economical installation and maintenance. Capsule-type housings permit access to motor interior without exposing bearings. Dual oil rings provide uniform uninterrupted lubrication.

Your A-C representative can help you decide where to use these modern motors. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4107

ALLIS-CHALMERS

4 Powerful Reasons Why CHEVROLET ADVANCE-DESIGN TRUCKS

work harder . . . work longer . . . work for less!

MORE POWER AT LOWER COST! You can look forward to sizeable savings on gasoline with Chevrolet trucks on the job. In heavy-duty models, the advanced Loadmaster engine with new high-compression ratio of 7.1 to 1 delivers more power than ever—and does it on less fuel! In light- and medium-duty models, Chevrolet's Thriftmaster engine combines top-notch performance, with rock-bottom operating cost.

TAILORED TO YOUR JOB! Of course you want a truck that fits the requirements of your particular job. And you get just that when you buy a Chevrolet truck! You get the *right* power . . . the *right* chassis units from tires to transmission. Chevrolet trucks are *factory-matched* to do your work at lowest cost!

RUGGED AND RELIABLE! These great 1953 Chevrolet Advance-Design trucks are built stronger to stay on your job longer! Frames, for example, are sturdier and more rigid. And you'll find extra strength in other vital places, too. The result is a truck that gives you extra miles and months of low-maintenance operation.

LOWEST PRICED LINE! You start saving money the moment you buy a Chevrolet truck. For, in addition to all its other advantages, Chevrolet is *America's lowest priced truck line!* Why not start saving *now!* Your Chevrolet Dealer will be happy to give you all the facts. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load. **POWER-JET CARBURETOR**—for smooth, quick acceleration response. **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement. **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **HYPOID REAR AXLE**—for dependability and long life. **TORQUE-ACTION BRAKES**—on light-duty and medium-duty models and on front of heavy-duty models. **TWIN-ACTION REAR BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models. **CAB SEAT**—with double deck springs for complete riding comfort. **VENTIPANES**—for improved cab ventilation. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—for easier handling. **UNIT-DESIGNED BODIES**—for greater load protection. **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.

CHEVROLET first in demand in value in sales

CROUSE-HINDS quality starts with the casting

Type FLB Explosion-Proof
Circuit Breaker Conduiet

Type ARE Plug Receptacle
With Spring Door

Type GUAC Explosion-Proof
Junction Conduiet

Type LB
Obround Conduiet

1. A highly skilled patternmaker, with long years of experience in precision craftsmanship puts the finishing touches on an Obround CONDULET master pattern.

They're made right to serve you better.

Working from designs that have been carefully developed in the Engineering Dept., expert patternmakers make the master patterns. Perfect workmanship is a tradition in Crouse-Hinds Pattern Dept., where half the workers have records of from twenty-five to more than forty years of service.

Crouse-Hinds Iron Foundry is one of the largest and best equipped of its kind. It has the latest mechanical improvements to enable the skilled molders to produce the best possible castings. Most CONDULETS are made of Feraloy, Crouse-Hinds special alloy having the desirable characteristics of both cast steel and gray iron. It is strong, tough, holds its shape, is inherently corrosion resisting, homogeneous, and machines well, giving sharp, full threads.

To maintain Crouse-Hinds high standard of quality there is constant checking and testing. In the Foundry Control Laboratory, core and molding sands and oils are examined. Only the best are used. Continual temperature readings of molten Feraloy are taken, and test bars are made and tested for strength in the Mechanical Laboratory. The Chemical Laboratory makes daily analyses of the Feraloy output of the foundry.

Crouse-Hinds Non-Ferrous Foundry is equipped to turn out high quality castings of aluminum, bronze, and other metals.

When quality counts use CONDULETS. They're made right ... to serve you better ... and last longer.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

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Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

CONDULETS TRAFFIC SIGNALS

. . . and goes thru every step

That's why CONDULETS last longer*

2. Expert molders operate the molding machines in Crouse-Hinds modern foundry. Sand hoppers are shown at top.

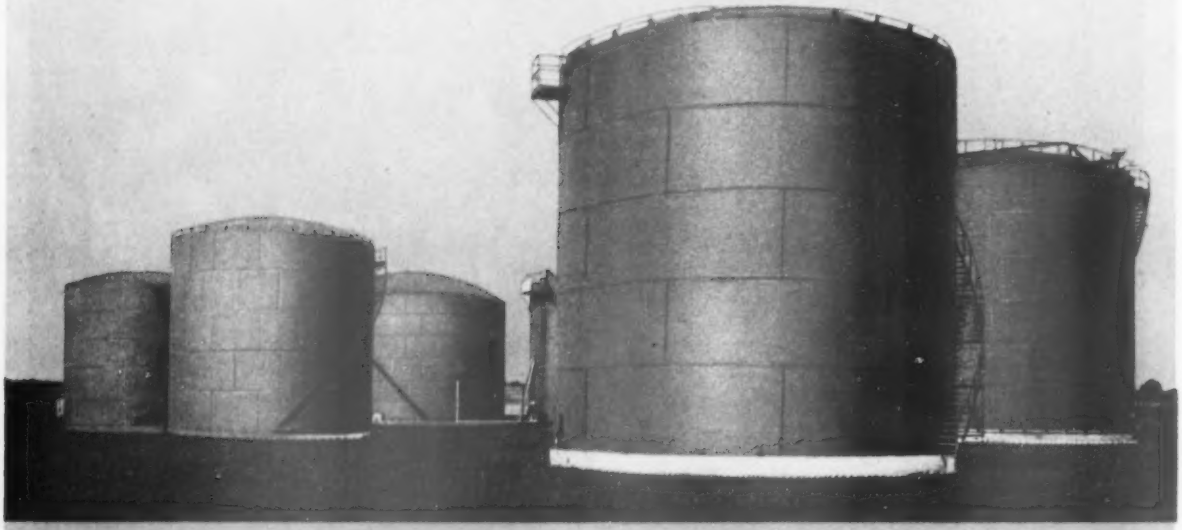
3. Molten Feraloy is poured into the molds from a distributing ladle in Crouse-Hinds mechanized foundry.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CONDULET
First in the field
STANDARD OF QUALITY
A Nationwide Distribution Through Electrical Distributors

FLOODLIGHTS • AIRPORT LIGHTING

STANDOUTS IN PROTECTION



for OIL PRODUCTS

BUILDERS OF TANKERS, OIL BARGES and OFF SHORE DREDGING EQUIPMENT

BIRTANK, famous name in storage tanks, can solve your storage problems permanently and economically. Tight-seamed, 100% welded BIRTANKS are designed to your own specifications and in standard sizes. With our facilities, the whole job, from shop fabrication to erection, can be done quickly and at low cost.

AN INGALLS BIRTANK PRODUCT

FOR COMPLETE INFORMATION ON **BIRTANK** WRITE:

BIRMINGHAM TANK COMPANY

Division of
THE INGALLS IRON WORKS COMPANY
Main Office: Birmingham, Ala.
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A TYPE AND SIZE FOR EVERY OIL STORAGE REQUIREMENT

MARSH

... the gauge with the "Recalibrator"

Any pressure gauge can be knocked out of adjustment, but when it's a Marsh Gauge you can quickly correct it with the twist of the "Recalibrator" screw.

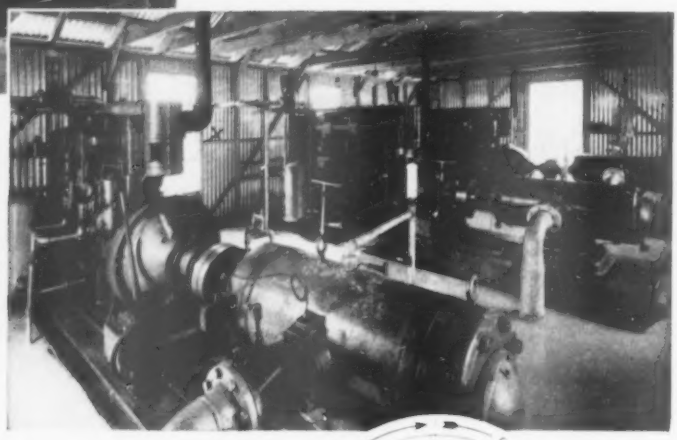
This is not only the handiest way to correct a gauge; it is also the best way. Conventional methods of adjustment simply compensate for the error. The "Recalibrator" corrects the relationship between the movement and the bourdon tube—actually *does re-calibrate* the gauge.

MARSH INSTRUMENT CO. Affiliate of James P. Marsh Corp. Dept. L. SKOKIE, ILL.

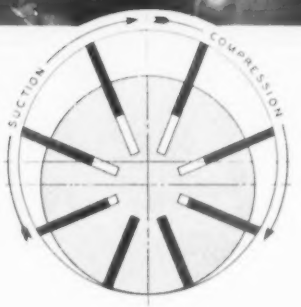
Export Dept.: 155 E. 44th St., New York 17, N. Y.

The Marsh line includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other applications including oxygen and welding gauges. Ask on your letterhead for new catalog just off the press.

Two Fuller rotary two-stage gas boosters, each handling 1,500,000 SCFD, with atmospheric inlet pressure, or 2,500,000 SCFD, 10 psig. inlet pressure can be handled compressing to 70 psig. discharge, electric motor drive.



Three Fuller rotary single-stage natural gas boosters, capacity each 1,430,000 cu. ft./24 hrs. from 5-lb. to 25-lb. gage, driven by Climax gas engine.



BOOSTING GAS?
with FULLER rotary compressors
IT NEED NOT BE COSTLY

Fuller Rotary Compressors for booster service have many advantages that warrant your closest examination, whether for field boosting or to trunk-line levels. You'll find these units do a better job . . . better because they reduce maintenance cost, cut inspection time, last longer, do the job efficiently.

They're sturdy, dependable, because they have a minimum of moving parts—rotor, bearings, blades—requiring minimum attention. No valves to leak, no seats to grind; blades automatically compensate for wear, *maintaining capacities for the life of the machines.*

No detail has been overlooked that will make for long-term, trouble-free service, at the lowest maintenance and operating cost. These features explain why Fuller boosters do an outstanding job wherever gas is handled. For detailed information on Fuller Rotary Compressors, that will do a better job for you, write for Bulletin C-5A.

FULLER COMPANY—CATASAUQUA, PA.

Branch offices

Chicago—San Francisco—Los Angeles—Seattle—Birmingham

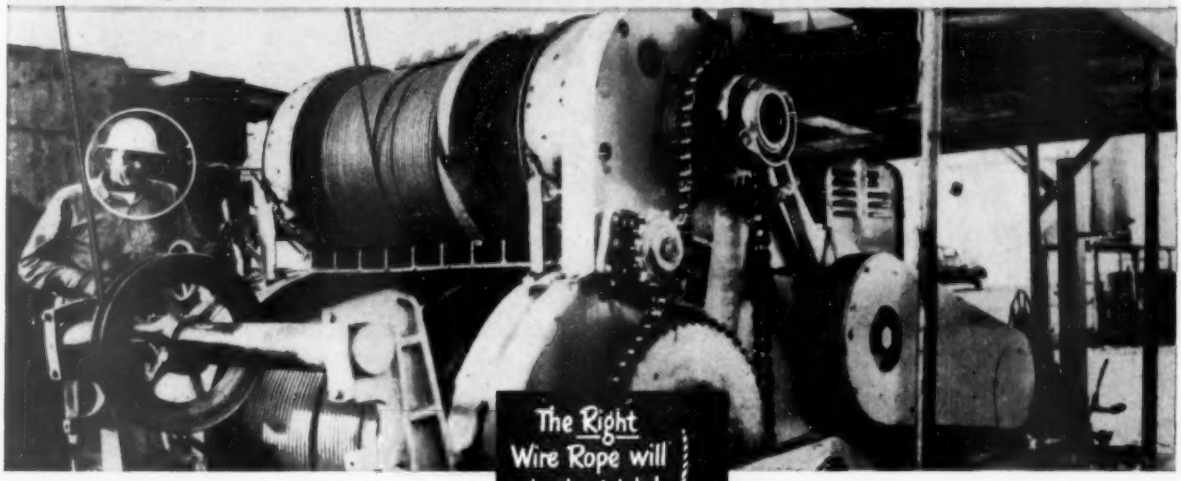
Fuller

PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS

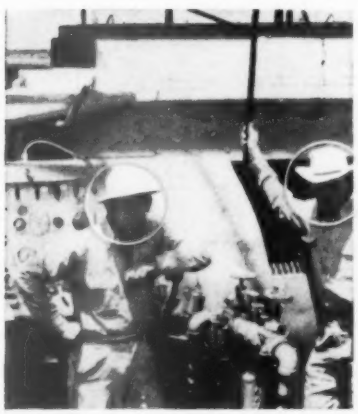
C-238
2155

THE MEN WHO USE THEM SAY:

"Tiger Brand Lines are best!"



"PERFORMANCE SOLD US on American Tiger Brand Wire Lines. They're tops with us!" . . . G. A. Monahan & K. D. Cole Rotary Drilling and Cable Tool Well Service. The rig shown had a 7/8" Tiger Brand 6x19 Plow Steel Line. Sand line was 5/8" Tiger Brand 6x7 Plow Steel.



"WE USE AMERICAN WIRE LINES because they give us longer service and less trouble." . . . Tri-Service Drilling Co. The 1¼" Tiger Brand Rotary Drilling Line shown above was used on 7 wells—a total of 49,700 ft. of extremely tough drilling—and it was still in good shape.

"WE DRILLED 9 WELLS with one 7500-ft. length of American Wire Line. It didn't give a bit of trouble in over 93,000 ft. of hole—and still has lots of good service left." . . . Helmerich & Payne Drilling Contractors. It was a 1¼" Tiger Brand 6x19 Monitor Drilling Line with Independent Wire Rope Core.

ASK any driller who has American Tiger Brand Wire Lines on his rig and he'll tell you that they give exceptionally long service. Whether you are down just a few thousand feet by cable tool, or way down deep by rotary, you can count on Tiger Brand Lines for top-notch service.

Ten constructions, three standard grades of steel, and countless sizes, assure you a long-lasting Tiger Brand Line for every job. But you want to be sure to get the right type: the one that will give top performance on *your* particular rig.

Our free booklet, "The Right Rope for the Job," will help you. It lists the right line to use for many typical applications. Send the coupon for a free copy.

American Steel & Wire
Room P-103, Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, your helpful guide book to rope selection, "The Right Rope for the Job."

Name .....

Company ..... Title .....

Address .....

City & State .....

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

Anticipating the Demands of the Oil Industry...

NATIONAL TUBE

THE growth and development of the oil industry during the past twenty-five years have been closely associated with the manufacture and improvement of seamless steel pipe. After well depths exceeded 4,000 feet, drill pipe, casing, and tubing of superior quality became more and more imperative. With present-day wells reaching depths of over 16,000 feet, the demands on tubular material have become even greater. All through this period of deep-well development, NATIONAL Seamless Pipe has been improved to meet —indeed, to *anticipate*—the constantly changing conditions.

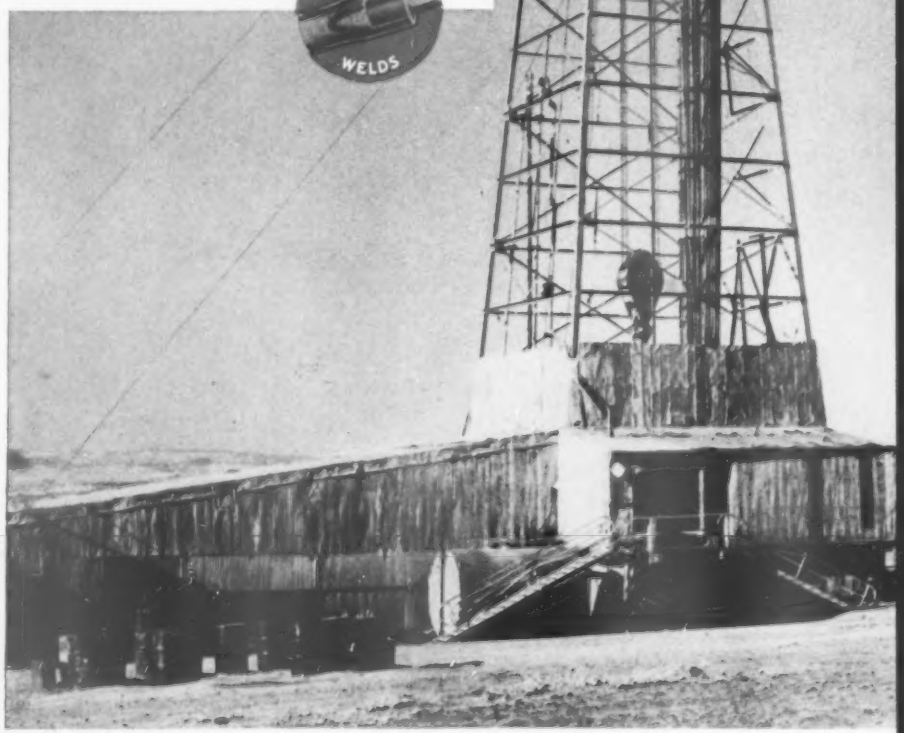
Year after year, National Tube has pioneered in the development of new products, the following of which are of special interest to the oil and gas industry:

DEOXIDIZED BESSEMER STEEL CASING AND TUBING
especially well-suited for oil production because of its combination of high yield strength and good ductility.

WARM-WORKED CASING
An extremely high-strength casing possessing a uniformity of physical properties which gives it high collapse resistance and greatly increased joint strength.

NATIONAL DEEP-WELL CASING
a stronger casing than is provided under A.P.I. specifications, to meet constantly increasing depths. Because it is intended for severe service it is hydrostatically tested to 80% of minimum yield strength up to a maximum of 12,000 p.s.i.

NATIONAL BUTTRESS-THREAD CASING
developed to satisfy the need for a casing joint which will safely and economically support the weight of deep-well casing. The buttress-thread joint is comparable in strength to that of the body of the pipe.



NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL SEAMLESS PIPE AND TUBES

USS

UNITED STATES STEEL

IN THE EAST TEXAS FIELD-WE DID OUR PART TOO

In the oil boom towns of East Texas in the Thirties, men made deals, scrambled after leases, and the storekeepers put up their Blue Eagles. And in the new oil fields, we at Beaumont Iron Works did our part, too. For BIW well head equipment was the overwhelming choice of oil men in East Texas.

Engineered and designed to do the job right and to do it for the years, you can see today in East Texas the toughness and long life built into all BIW equipment. Today, at the ***new*** Beaumont Iron Works Co., you'll find that the same toughness is engineered into BIW products. Built to do its job right, BIW equipment in drilling and production is still built for the years ahead—built to do its job right and built to justify your faith in this, one of the oldest companies in the oil fields.

BIW

BEAUMONT IRON WORKS
BEAUMONT, TEXAS
Subsidiary of American Locomotive Co.
General Sales Office: 1404 Dunlavy St.,
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ANOTHER LEADING OIL PRODUCING AREA WHICH HAS DEPENDED ON BIW EQUIPMENT.

PROTECT YOUR PRODUCTION

WITH

HARPER

corrosion-resistant fastenings

At the refinery or in the field, the bolts, nuts and screws upon which the satisfactory performance of all equipment depends are constantly subject to that arch enemy of metal—corrosion.

Harper Fastenings resist corrosion—corrosion caused by natural weathering—by salt spray—by sour crudes—by caustic solutions. Today, Harper is the largest exclusive producer of fastenings of such corrosion-resistant metals as brass, silicon bronze, naval bronze, Monel, nickel, copper and all stainless steels—over 7,000 different items carried in stock.

Harper metallurgists are ready to assist you in solving any tough corrosion problem you may be facing. Harper engineers will gladly work with you on the development of special fastenings to assure simplified manufacture or improved equipment. For information on fastenings, see your Harper Branch or Distributor.

THE H. M. HARPER COMPANY
8208 Lehigh Avenue, Morton Grove, Illinois

Chemicals you live by

"BET-A-MILLION" GATES WAS A PIKER!

Remember the spectacular gambler, Gates, who bet one million dollars? A piker!

The oil industry tosses millions away every year—gambling with corrosion. But the odds can be turned in favor of considerable savings by proper use of DIAMOND chromate and sodium bichromate to reduce corrosion. The life of drill strings may be increased 4 to 7 times with the use of these chemicals. Our customers in the oil industry who regularly use these preventative chemicals have proved they save money. Let the DIAMOND representative give you the facts.

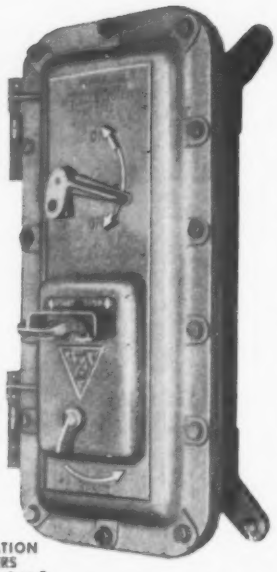
Other DIAMOND chemicals that save money for oilmen are carbon tetrachloride, bicarbonate of soda, caustic soda, chlorinated paraffins, chlorine, silicate of soda, and several specialties. If you don't know how these chemicals save money—don't you think it might be worth your while to investigate? Call DIAMOND.

DIAMOND ALKALI COMPANY
CLEVELAND 14, OHIO

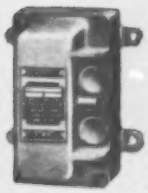
Diamond Chemicals for the Oil Industry

DIAMOND ALKALI CHEMICALS

You'll Find Quality and *Maximum* Protection in R&S *Explosion-Proof* MOTOR CONTROL EQUIPMENT



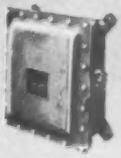
COMBINATION STARTERS
NEMA Sizes 0 to 5



PUSH BUTTONS
Standard and Heavy Duty

MOTOR STARTERS
Manual Types
NEMA Sizes 00 to 1
Magnetic Types
NEMA Sizes 0 to 5

CIRCUIT BREAKERS
— 15 to 600 amps.



DISCONNECT SWITCHES
Single and Double Throw types

Wherever R&S explosion-proof motor control equipment is used in hazardous locations, there's maximum protection and safety afforded plants and personnel . . . long trouble-free service life and low maintenance assured to Industry.

For over 50 years, R&S policy has combined the same basic "ingredients" into every equipment item — finest materials, top quality, sound engineering design, precision manufacture, and features that meet all standards, *plus!*

R&S Motor Control Equipment features include: Wall sections permitting a wide variety of conduit arrangements . . . ample wiring space . . . removable front covers for close grouping and easy maintenance . . . an improved adjustable handle with visible limit stops and provision for padlocking in "off" and "on" positions.

R&S also incorporates these standard components into factory assembled complete panelboards to meet specific needs.

OTHER R & S EXPLOSION-PROOF EQUIPMENT: Lighting Fixtures • Plugs and Receptacles • Pilot Lights • Conduit and Sealing Fittings • Signal Control Systems • Junction Boxes • Lighting and Power Panelboards

Write for Catalog H-47- 13

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N.Y.

RUSSELL & STOLL

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

THE PROOF IS IN THE FIELD . . .

Carter

Long-stroke Hydraulic Pumping Units

Featuring the amazing Variable-Cycle Principle

Designed — Built — Priced FOR STRIPPER WELLS

CALIFORNIA

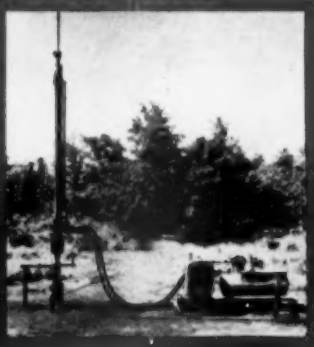
Carter Unit Pumping in Edna Field. Has been in service for seven years.

KANSAS

One of 4 units in the Great Bend Area, pumping from 3400 ft., owned by large independent.

EAST TEXAS

One of 8 Carter Units owned by a major oil company in Kilgore and Turnertown Areas. Pumping oilcreek from 3300 ft. Total cost about 60% of the cost of a conventional unit.



OKLAHOMA

One of [illegible] units owned by an independent in the Tulsa Area, pumping from about 1500 ft. Operator reports production holding up better than offsetting wells with conventional units.

KENTUCKY

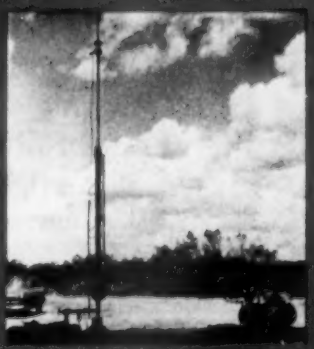
Carter Unit on 15-ft. substructure in the Green River Bottoms. Operator saved about 50% on substructure cost alone. This is one of seven units owned by this independent.

NORTH TEXAS

Major oil company installation in Caddo Field, pumping 30 bbl/day from 6250 ft. No rod failures in more than a year's operation. Total cost about 50% of the cost of a conventional unit.

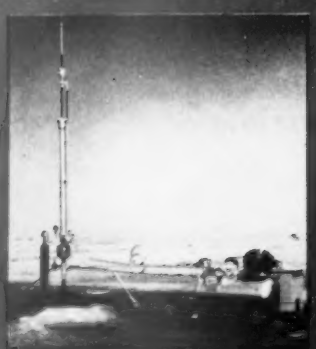
CANADA

Carter Unit operating at 30 degree-below-zero weather in the Carbondale Field, showing adaptability of Carter Unit to extreme climatic conditions.



SOUTH TEXAS

Production increased from 5½ bbl/day to 8 bbl/day on this 2700-ft. well in the Duval County Area, when it replaced conventional equipment. This is one of 11 units owned by this independent.



WEST TEXAS

Carter unit in the Spraberry Area, pumping from 7060 ft. This unit was installed for about 30% of the cost of a conventional unit.

MORE THAN 700 UNITS NOW IN SERVICE!

MORE THAN SEVEN YEARS OF FIELD EXPERIENCE!

From Canada to the Gulf, from Ohio to the Pacific, Carter Long-Stroke Hydraulic Pumping Units are saving thousands of dollars, for majors and independents alike, through lower first cost and maintenance as well as increasing production in many cases.

WRITE FOR BULLETIN PP-253

S. C. CARTER COMPANY, inc.

1900 Santa Fe Avenue • Los Angeles, California

Sales and Service Representatives in —

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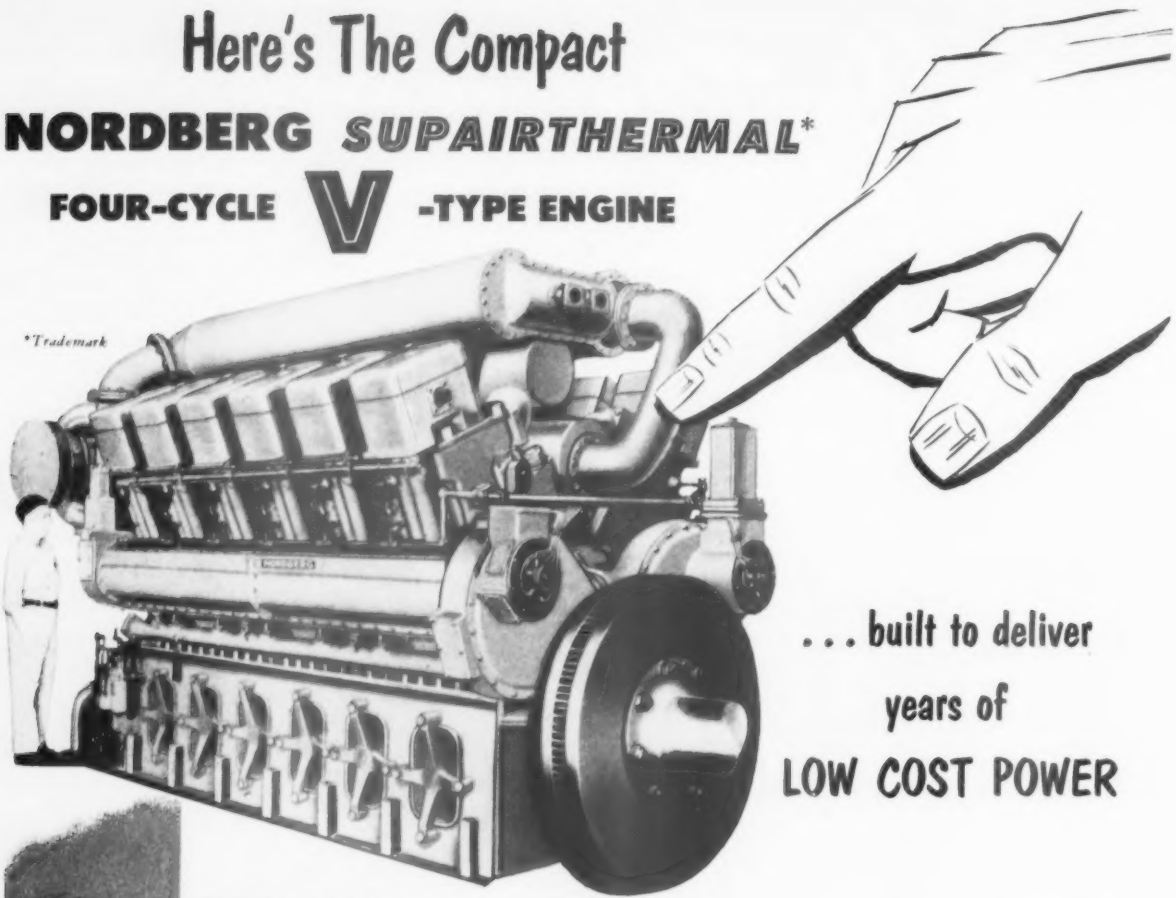
Here's The Compact

NORDBERG *SUPAIRTHERMAL** FOUR-CYCLE V -TYPE ENGINE

*Trademark



. . . built to deliver years of LOW COST POWER

FOR PIPE LINE PUMPING SERVICE

FOR COMPRESSOR SERVICE

FOR MAIN OR STANDBY GENERATOR SERVICE

NORDBERG 13"x16½" *SUPAIRTHERMAL** four-cycle V-Type engines are designed and built to meet the increasing demand for more compact, high efficiency Diesel, Duafuel® and Spark-Ignition Gas engines for continuous, economical operation in a wide range of power applications.

These heavy-duty Nordberg V-Type engines are available with 12 or 16 cylinders, covering a horsepower range from 2400 to 4260, at 450 to 600 rpm. Incorporating all of the tested and proved performance features of Nordberg 13" bore in-line engines, these V-Type engines operate at extremely high thermal efficiency, made possible by variable inlet valve timing control . . . *an exclusive patented Nordberg feature.*

For further details, write for BULLETIN 197.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

O1053

Mister . . . this proves it . . . a better Wire Rope has been built!

J&L SPRINGKORE
a new type drilling line

Here's what it gives You

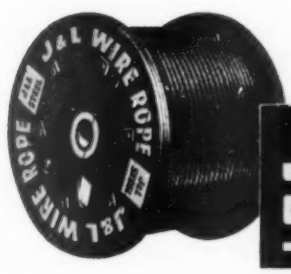
1. **Greater flexibility**
2. **Greater resistance to crushing**
3. **Economy**

Your First order will prove it

Here's why J&L SPRINGKORE does a better job for you

J&L SpringKore Drilling Lines are just what the name implies —a new type of wire rope in which the center of the rope is made of tightly coiled, high quality steel spring instead of an independent wire rope or fiber core. The outer strands of the rope are laid up in the regular J&L rotary drilling line constructions. This new J&L invention makes possible a flexible wire rope, yet provides a strong uniform support for outside strands against all the crushing action a rotary line receives. And, with all its advantages, you pay no more for SpringKore. Although it's a premium product, there is no increase in price.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH



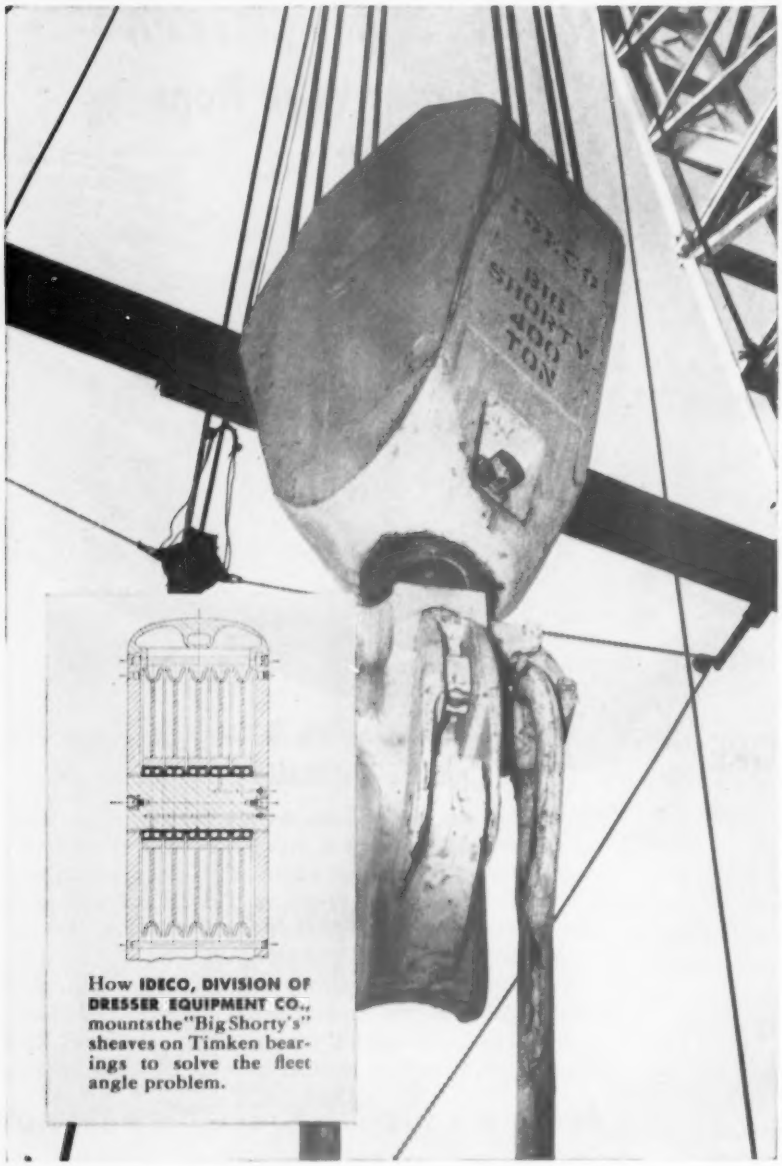
J&L STEEL

Now that you know about J & L SPRINGKORE . . . *let's get together!*

JONES & LAUGHLIN STEEL CORPORATION
416 Gateway Center, Pittsburgh 30, Pa.
I'd like to have more information on J&L SPRINGKORE DRILLING LINES.

Name _____
Title _____
Company _____
Address _____

Fleet angles no problem for new IDECO 400-ton shorty block with sheaves on TIMKEN® bearings



How **IDECO, DIVISION OF DRESSER EQUIPMENT CO.,** mounts the "Big Shorty's" sheaves on Timken bearings to solve the fleet angle problem.

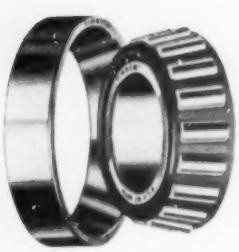
LOOK at the diagram at the left. It shows how Ideco engineers solve a potential problem in the sheaves of their new 400-ton "Big Shorty" traveling block—that of end thrust set up by fleet angles on the lines.

The answer is in mounting the sheaves on Timken® *tapered* roller bearings. Straight bearing designs can't possibly cope with thrust loads set up by the drill string's full weight. But being *tapered*, the Timken bearing can take heavy thrust as well as radial loads. And as a consequence, the bearings locate the sheaves positively regardless of line load or lead.

As Ideco reports: "The two-row tapered bearing indirect mounting provides maximum possible stability for those large diameter sheaves . . . and the sheaves carry full drill string weight and still rotate easily and freely . . . and the bearings stand up well under grueling service and give long, trouble-free operation."

No other bearing gives you all the advantages offered by Timken *tapered* roller bearings. Specify Timken bearings in the oil field equipment you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

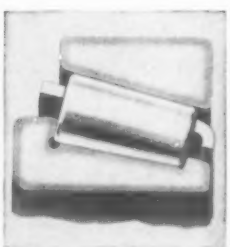
This symbol on a product means its bearings are the best.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

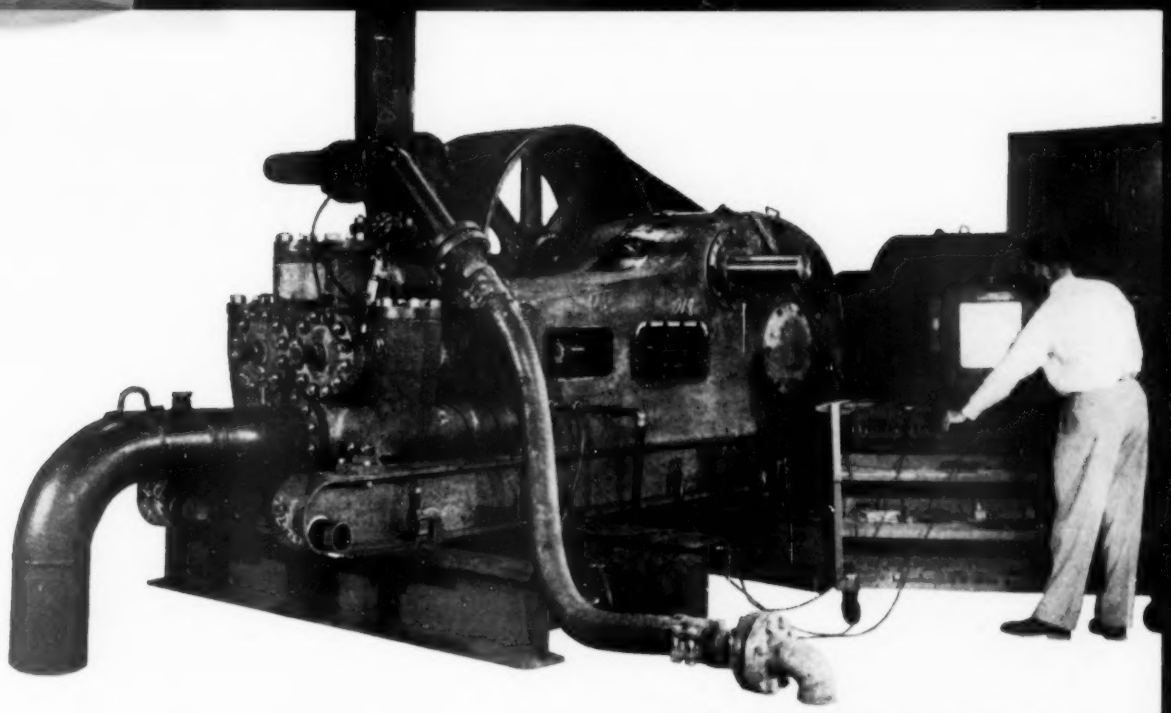


GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →← LOADS OR ANY COMBINATION



FINAL TEST RUN. Before an Emsco Power Slush Pump is released to the field, it must pass a critical factory test, shown in progress in the above photograph. Special electronic equipment is used in testing pressures, volumetric efficiency, valve action and metal stresses.

WE ARE OUR PUMPS' TOUGHEST CRITICS

Before we ship your Emsco Power Slush Pump we put it through its paces in an 8-hour test run under pressure. This includes a two-hour break-in run, under low pressure and at slow speeds, to assure that the lubricating system is functioning perfectly and that all working parts are operating properly.

The pump is then run under load at maximum pressure and at maximum speeds, with vital working parts being continually checked. When it passes this shakedown run it is ready for field service.

This same equipment is used in testing new materials and design changes in Emsco Power Pumps.

NEW POWER PUMP BOOKLET shows in detail how Emsco Pumps are made . . . gives specifications . . . performance data . . . general features . . . lists factors determining horsepower requirements of your pump.

Write for Bulletin B-191.

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REG. U.S. PAT. OFF.

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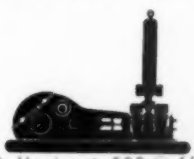
Distributors: Bovaird Supply Company, Tulsa, Oklahoma. Mid-Continent Supply Company, Fort Worth, Texas. *Export Distributor:* Mid-Continent Supply Co., Inc., 42 Broadway, New York 4, N. Y.

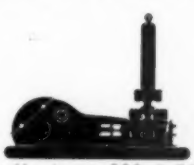
E-145-53

PUMPS TO MEET EVERY DRILLING NEED

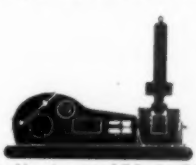
D-850: Hp. input, 850 @ 60 rpm.



D-500: Hp. input, 500 @ 65 rpm.



D-300: Hp. input, 300 @ 70 rpm.

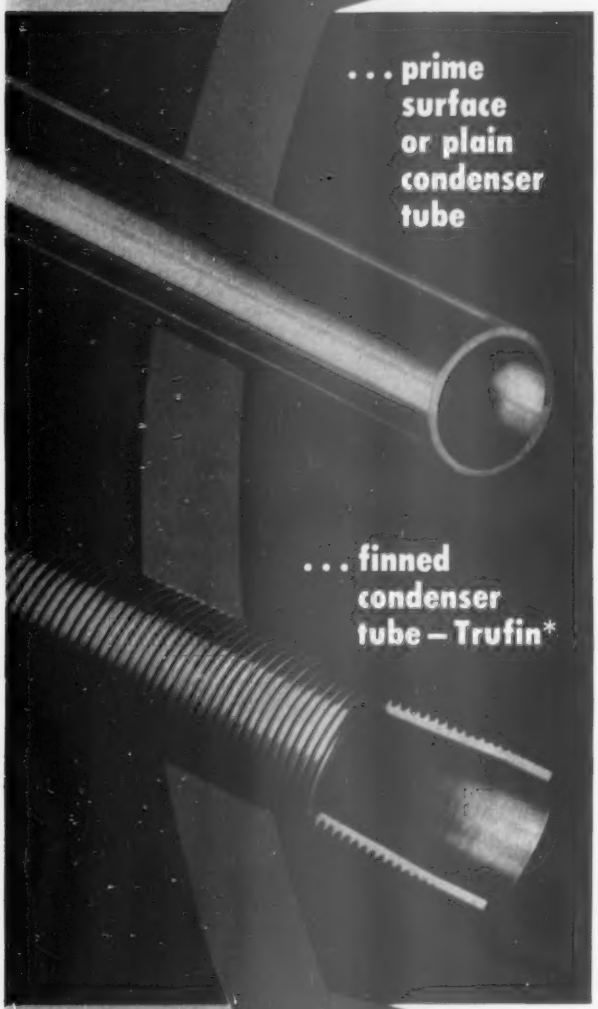


D-175: Hp. input, 175 @ 75 rpm.

EMSCO SERVICE ENGINEERS ARE AVAILABLE IN EVERY MAJOR OPERATING AREA

4 Wolverine Products

PRIME EXAMPLES OF



WOLVERINE CONDENSER TUBE

of copper and copper-base alloy and steel is produced under the type of control that gives real meaning to the word Tubemanship. Which, in turn, is just another way of saying Wolverine is backed by over thirty-seven years' experience in the manufacture of all kinds of tubing. Wolverine produces plain condenser tube in sizes ranging from 5/8" to 2" O.D.

WOLVERINE TRUFIN

the integral finned tube—provides the following advantages: (1) more compact, economical heat exchanger or condenser unit design, (2) can be assembled, rolled or brazed into headers by conventional methods, (3) in many applications, can greatly increase capacities of existing units, (4) can be directly substituted for prime surface condenser tubes.

Trufin is made in a wide range of sizes for shell and tube units. Trufin is available in copper, copper-base alloys, aluminum, carbon and stainless steel; as well as in bi-metal.

IMPORTANT

Next time any questions arise regarding tubing or its application to Your particular problem—just give Wolverine's Technical Sales Department a call. There's no obligation. No cost. In the meantime, write us for an informative, free booklet covering the products which interest you.

for Processors

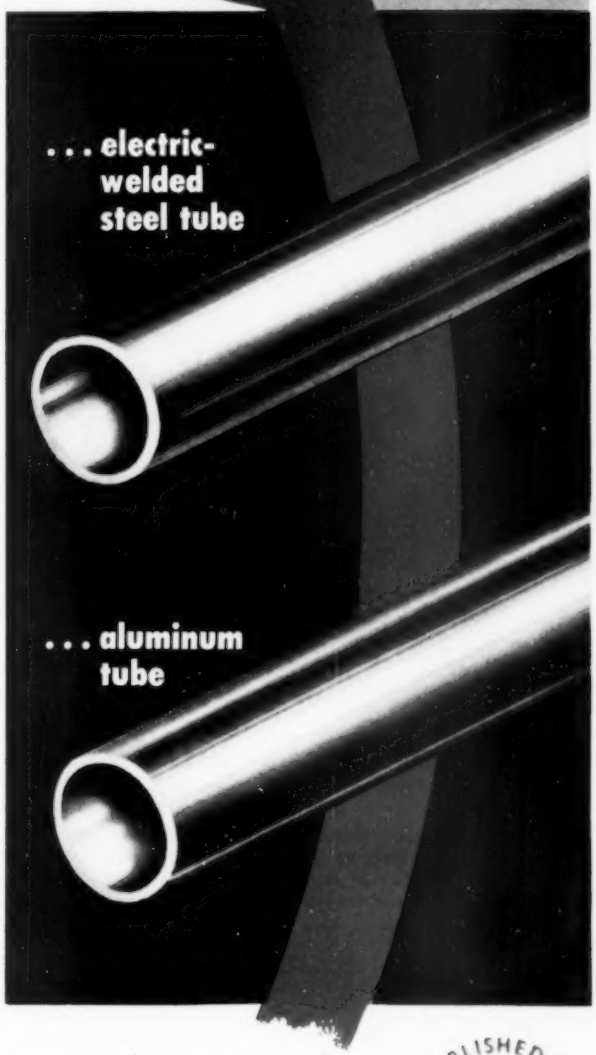
"Tubemanship" AT WORK!

ELECTRIC-WELDED STEEL TUBE

Here again, Wolverine Tubemanship pays off. The same attention to detail, the same quality control standards which have been built up as a result of thirty-seven years of tube making—combine to produce a dependable new product: Wolverine electric-welded steel tube. Wolverine electric-welded steel tube is produced in sizes ranging from ¼" through 3" O.D.—and in the following analyses: SAE 1010, SAE 1015, SAE 1020, SAE 1025, SAE 1030.

ALUMINUM TUBE,

too, is another product of Tubemanship. You can get it in 2S and 3S aluminum and in standard sizes from ½" through 2" O.D. Wall thicknesses range from .020 through .180. Remember that Wolverine makes Trufin of aluminum or bi-metal—aluminum with a copper lining.



*REG. U. S. PAT. OFF.

Wolverine Trufin and the Wolverine Seam End Process are manufactured in Canada through the Trufin Tube Co., London, Ontario.

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.

ESTABLISHED 1916

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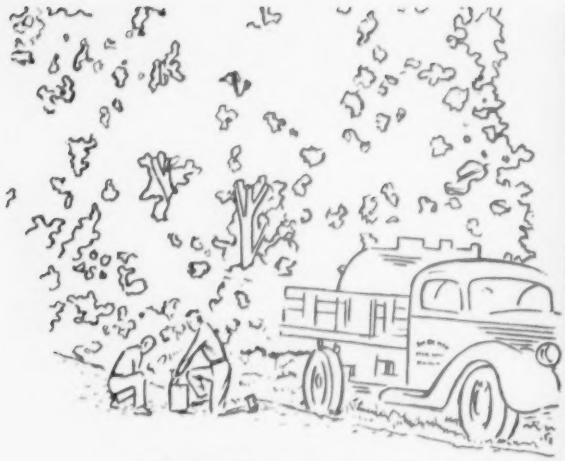
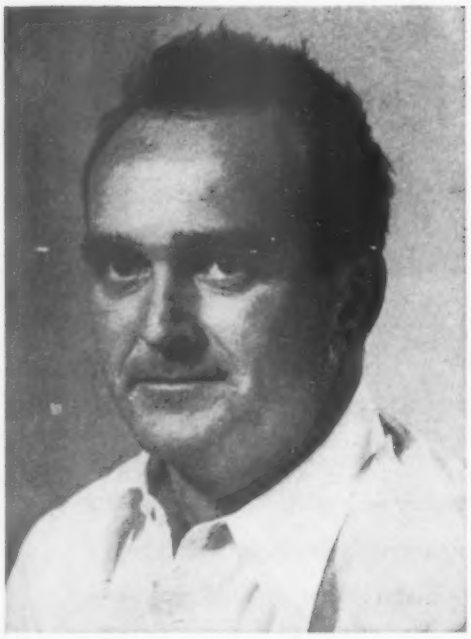
EXPORT DEPT., 13 E. 40th ST., NEW YORK 16, N. Y.





JAMES D. CRARY, *now a Party Chief, had his B.S. degree from St. Lawrence University when he started digging shot holes for Independent 16 years ago. Such a record of experience is characteristic of the men responsible for the success of Independent's field work.*

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The planning and direction of hundreds of geophysical surveys and the analysis of thousands of seismic records have given Independent the broad experience on which to base accurate, thoroughgoing interpretations. Often this experience applied to the review of existing survey data has proven of great value in saving work, time and money for our clients. In field work, analysis of data, review interpretation, and every phase of geophysical service it pays to rely on Independent, one of the oldest exploration contractors in the business.

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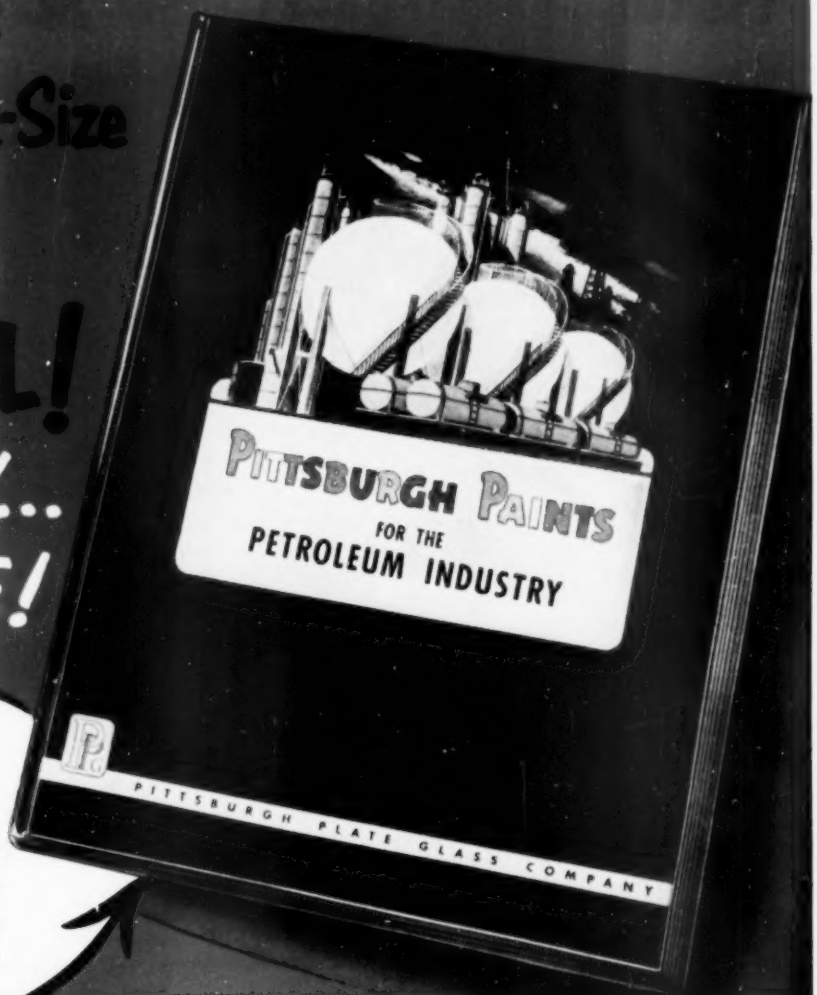

Table of Contents Includes:

1. **Product description.**
2. **Application recommendations.**
3. **Large-size color chips.**
4. **Inspection, surface preparation and painting of storage tanks.**
5. **General maintenance and painting suggestions.**
6. **Recommendations for painting automotive equipment.**
7. **How to use COLOR DYNAMICS painting system.**

PITTSBURGH has just issued a highly practical manual of information for those who buy and use paints in the petroleum industry.

● **This ready reference volume** contains complete descriptions of all Pittsburgh Paints for this field. These finishes are the finest it is possible to make. Their formulations are the result of the latest and best knowledge developed by Pittsburgh's large and skilled technical staff. Among its advancements are special *"Vitolized Oils"* and the process of molecular selection which have contributed so much to the exceptionally high-level performance of these coatings.

● **Also included** in this manual are numerous suggestions for proper application and maintenance. Many of these have been derived from Pittsburgh's long experience in supplying leading petroleum producers with high-quality finishes that have proved to be unusually successful in beautifying and preserving many types of surfaces.

● **By keeping this manual** handy you may be able to save time and money. We'll be glad to send you a copy without cost or obligation. Just fill out and mail coupon below, with one of your company's letterheads.

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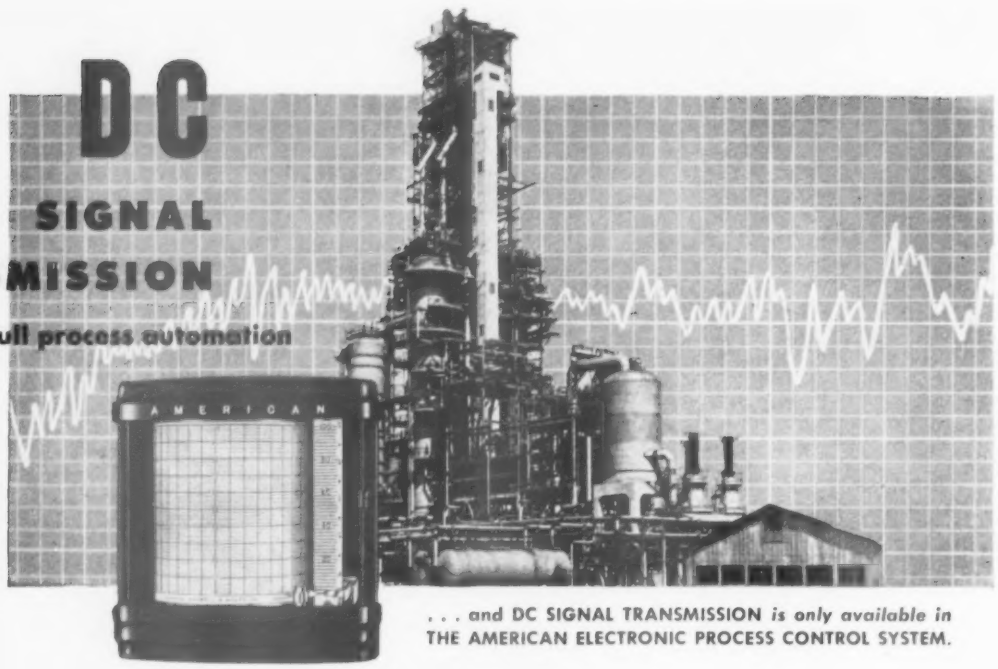
DC SIGNAL TRANSMISSION

the key to full process automation



. . . and DC SIGNAL TRANSMISSION *is only available in* THE AMERICAN ELECTRONIC PROCESS CONTROL SYSTEM.

Most modern electronic print-out, monitoring and computing equipment is designed for DC operation. Until recently it was impractical to integrate these automatic devices with instruments that measure process variables. Consequently, complete process automation was impossible.

Now—the new American Electronic Process Control System provides the major compatability factor essential to achieve the economic advantages of full process automation: *DC signal transmission.*

The instantaneous DC transmission of process variable measurements permits higher controller gains that result in a new concept of control performance. At the same time, it makes possible the efficient "electric nerve center" so essential to the low-cost operation of the ultra modern plant of today and the standard plant of the future. In short, the American Electronic Process Control System provides the only practical foundation for integration of . . .

1. **AUTOMATIC LOGGING** — the continual listing of operational data in tabulated digital form.
2. **AUTOMATIC MONITORING** — the centralized supervision of all measured criteria for maximum safety and efficiency.
3. **AUTOMATIC COMPUTING** — for precise accounting and engineering analysis at highest speed and lowest cost. Ushers in the fully automatic plant with completely automatic product analysis and control.

In addition to this unique versatility, the American Electronic Process Control System offers *improved quality of control*—tighter control that opens the way for a reduction in the size of process equipment and consequently a lower capital investment for a given through-put. Furthermore — *simplified communication* — with two-wire DC signal transmission lines that are unaffected by induced alternating currents and varying line resistance, the cost and complexity of present systems will be vastly reduced.

When you select process control equipment, basic considerations are performance, initial installed cost, reliability, maintenance, and flexibility. The advanced design and operation of all instruments in the American Electronic Process Control System assure complete satisfaction on every count. Convince yourself. *Write for Catalog No. 164.*

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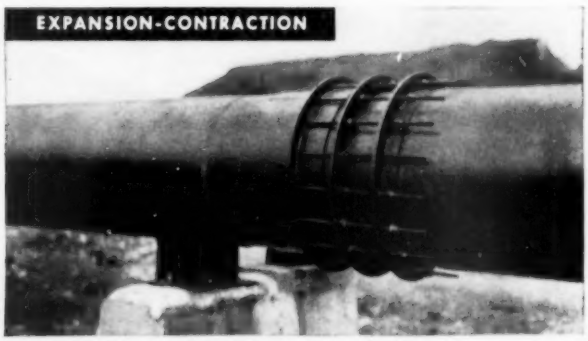
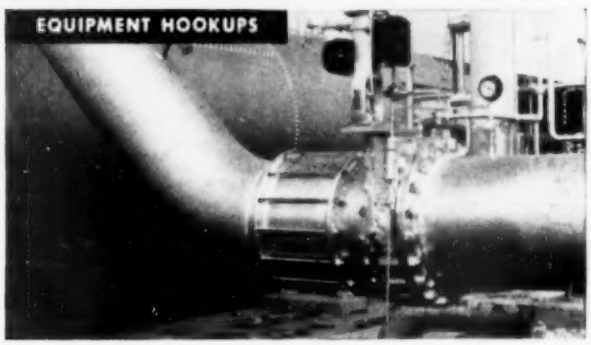
MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, AIRCRAFT PRODUCTS. BUILDERS OF "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

IN THE OILFIELDS . . .

the DRESSER way is *easier . . . surer!*





As an oilman, you're interested in joining pipe quickly . . . maintaining tight joints . . . making fast repairs with minimum losses and shutdowns. Using Dresser Couplings and repair products, you can do just that.

Dresser Couplings or Long Sleeves go together simply and quickly. Resilient Dresser Gaskets assure flexible joints which absorb settlement, other movement . . . on well and separator piping . . . salt-water lines . . . tank, pump, engine and compressor connections.

When a split, break or leaking joint occurs, Dresser Clamps and Sleeves turn an emergency into a simple repair job—completed in a matter of minutes *without shutdowns.*

You'll find there's a Dresser product for every condition and requirement affecting oilfield pipe lines, and that the DRESSER way is *always* easier, surer.

AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES

Style 38
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Style 40
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Style 39
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Style 55
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HALLIBURTON'S RETRIEVABLE PACKER

Under normal conditions, this tool is back on the bank in about one hour after cement has been placed. The reason is simple. This Packer is *retrievable*. There is nothing to drill out.

Simplicity of design and construction are top features of this versatile Packer. A complete assembly consists of a slip body with hydraulic slips, two packer cups, and a circulating valve. Circulating ports are closed by picking up a few feet on drill pipe or tubing. Applied fluid pressure causes rubber cups to seal tightly, and slips set so firmly that normal squeeze pressures required can be applied below Packer cups to do the job.

When the squeeze job is completed, pressure is released from tubing and applied to annulus to start fluid circulation around the packer which clears tubing and packer of all excess cement.

Halliburton's Retrievable Packer has proved its ability to perform successfully in thousands of remedial well jobs. Operators have used it to correct channeling, control unwanted water, repair casing leaks, recement liners, and in a variety of additional remedial tasks.

Get back on production hours sooner by using this one-trip Retrievable Packer on your next squeeze job. Phone your nearby Halliburton representative. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

YEARS AHEAD IN SQUEEZE CEMENTING!

Looking for solutions to all piston ring problems?

It will pay you to look to Koppers . . . here's why:

Every Diesel, gas engine, pump and compressor presents a different piston ring problem. So it pays to go to the source that can look for the solution from every angle . . . Koppers American Hammered!

In one complete, modern plant, American Hammered produces rings for every industrial application . . . in sizes ranging from less than one inch to ten feet in diameter. Ready to serve you are large foundries equipped for both static and centrifugal casting . . . a modern heat-treating plant . . . one of the largest and most up-to-date chromium plating plants . . . modern machine shops . . . an efficient engine test laboratory . . . a modern and complete piston ring research laboratory.

Outstanding product quality, assured by trained metallurgical and engineering staffs . . . supplemented by field engineers, thoroughly familiar with ring applications . . . results in efficient service and analysis of your specific problem. For experienced help with *your* problems, mail this coupon. No obligation, of course.

Compression Ring is a one-piece, quick-seating piston ring. One-piece construction gives maximum strength. Turned finish on outside diameter enables ring to conform readily to cylinder bore. Chemically treated surfaces promote rapid seating with freedom from scuffing or scoring during run-in. $1\frac{1}{2}$" to 120" diameters.

Porous Chromium Plated piston rings are manufactured by the exclusive Van der Horst process. Produced with a shallow porosity on the cylinder contacting surface, this ring facilitates break-in, holds and distributes oil during this critical period. Lasts four times longer and cuts cylinder wear up to 75%. $1\frac{1}{2}$" to 42" diameters.

Conformable Oil Ring maintains constant unit pressure for positive oil control. Conforms readily to meet cylinder distortion because flexible cast iron member is pressed outward by abutment type spring which exerts uniform radial pressure around entire circumference. 4" to 25" diameters, $\frac{1}{4}$" min. width.

Koppers Seal Ring has either one of two projecting bands of bearing bronze inserted in its cylinder contacting face. High unit pressure on narrow bronze bands takes quick initial seat, tends to prevent blow-by in both new or worn cylinders. Burnishing action of bronze on cylinder walls decreases scuffing and wear. 2" to 30" diameters.

Grooved Oil Cutter Ring has been adapted as standard equipment where oil control has previously been a major problem. Unique design incorporates two bevels for riding over oil on upstroke, plus a series of wide drainage slots. $1\frac{1}{2}$" to 25" diameters.

Plus Ring Materials to fit every need, such as: K-IRON®, a high grade, closely controlled, individually cast grey iron used in majority of applications . . . and K-SPUN®, a malleable type iron, centrifugally cast for applications requiring high strength, high elastic modulus and superior impact resistance.

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FOR EVERY PURPOSE

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1650 Hamburg St., Baltimore 3, Md.
I'd like help with my piston ring problem.

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Company .....

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City ..... State .....

How much should you spend for valve maintenance?

In all but the most simple services, *any* kind of valves need *some* maintenance.

Of course the same thing is true with any mechanism where metal rubs metal. Take your car, for example. You lubricate the engine to *reduce* maintenance and save major repair bills. If you don't lubricate it, you save a few dollars on lubricant, but pay the far, far higher costs of part replacement. More important, you'll need a new car much oftener.

Exactly the same principle applies to valves. If you install Nordstrom lubricant-sealed valves, maintenance is generally confined to adding lubricant at intervals. You lubricate to *reduce* maintenance—to avoid the high costs of major repairs, new parts, and shorter valve life. That's the big advantage of Nordstrom valves in the first place.

Over a 20-year period, Nordstrom sales of repair parts have been less than half of one per cent of sales. In several plants in which records were kept and where Nordstrom and other valves were used, repair parts for Nordstrom valves ran about one-tenth of other makes.

LUBRICANT SEALS AND SAVES

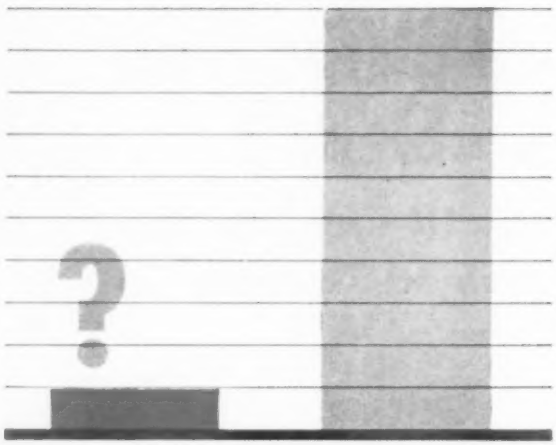
Lubricant has several functions in a Nordstrom valve, but there are two major ones . . .

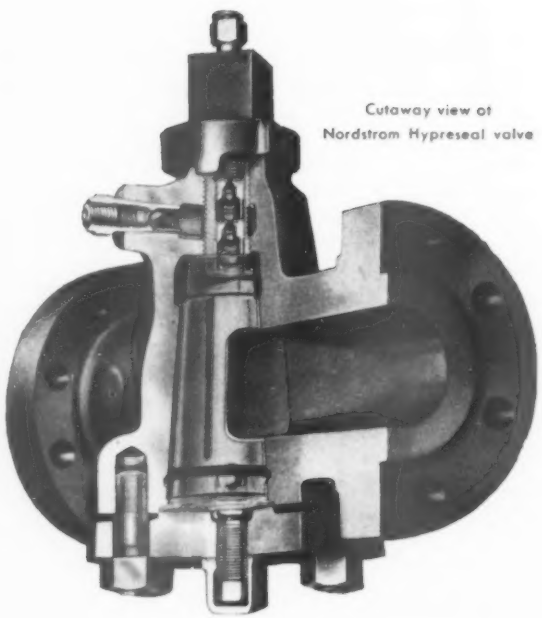
First, it *seals*, surrounding the valve ports with a coating that stops little leaks before they become big problems.

Second, it *lubricates* so the plug slides without the grinding, galling wear that means high replacement costs.

So, don't be misled . . .

Valve lubrication doesn't *cost* money, it *saves* money. If you'd like to discuss the application of Nordstrom valves for any service, call your Nordstrom representative or write Rockwell Manufacturing Company, Pittsburgh 8, Pa.

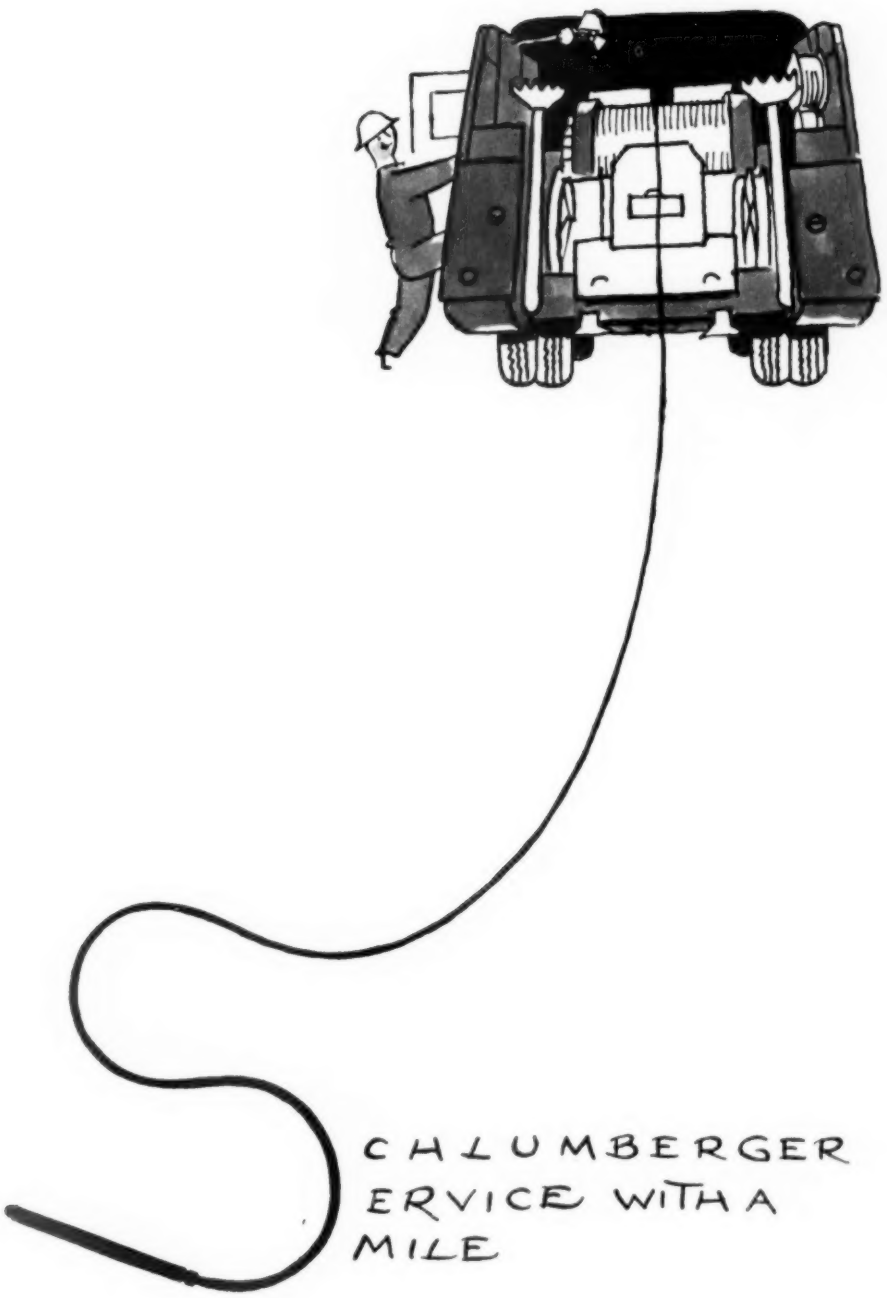




Cutaway view of Nordstrom Hypreseal valve

ROCKWELL Built
Nordstrom Valves
Lubricant-Sealed for Positive Shut-Off

Another Rockwell Product



Schlumberger Well Surveying Corp. • Houston, Texas

Meet a man with 15 mouths to feed

Frank S. Corda farms 240 acres in California's Salinas Valley. We know Mr. Corda well because Standard Oil Company of California fuels the power that tills his land. By replacing muscles with machines, as Mr. Corda has done, the average U. S. farmer produces enough food for 15 people. One hundred years ago a good farmer produced enough to feed only five people. Mechanized farming, powered by oil, has made the difference.

Insect "bomber" demonstrates one way petroleum helps make farms more productive and profitable. Airborne insecticides made by Standard's subsidiary, California Spray-Chemical Corporation, are so effective that they save western farmers millions of dollars a year in crop losses. Other petroleum products save time and labor... for example, a tractor can work 10 acres in the time a team of horses takes to plow two. We also had a hand in that, because Standard developed the first compounded lubricating oil that made high-speed diesels for tractors practical. Fuels and lubricants for farm machines, weed killers, roof coatings, stock dips, detergents, bottled gas for refrigeration, cooking and heating—they're all on the long list of items supplied to western farms by Standard. And you, too, benefit from each new way Standard scientists increase the yield of farms . . . because *you* may be one of the 15 people Mr. Corda feeds. *Questions or comments about our Company are always welcome. Write: Standard Oil Company of California, P. O. Box 3495-C, San Francisco, California.*

STANDARD OIL COMPANY OF CALIFORNIA ***plans ahead to serve you better***

How SUNRAY OIL boosts pipe line capacity 25%

Three years ago production skyrocketed at the Sunray Oil Corporation refineries in Duncan and Allen, Okla. Expansion throughout the system overloaded the 6-inch pipe line between the two cities. Bigger pipe was not available.

Sunray engineers hit on a cost-cutting solution—installed three electrically powered booster stations between regular pumping stations. They know that electric motors cost less to install . . . require little maintenance . . . are easily adapted to remote control circuits.

Then engineers selected an RCA 960-mc Microwave radio-relay system to effect complete remote control of the *"boosters"* from regular pumping stations. Microwave stations spaced miles apart proved cheaper to install and maintain than direct wire. And Microwave systems are virtually weatherproof.

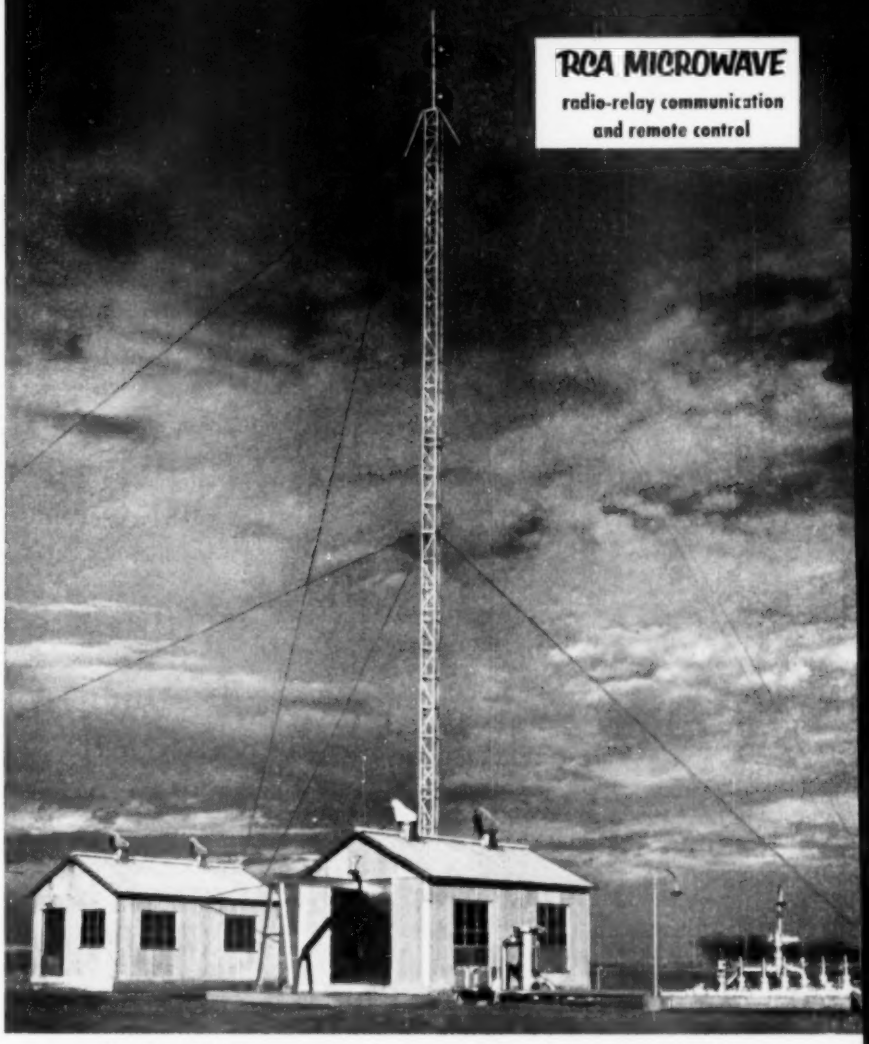
When the Sunray microwave-operated *"boosters"* were put in operation on January 31, 1952, *the pipe line's capacity immediately increased 25 per cent!*

RCA Microwave "beams" highly directional radio signals from station to station by "dish" antennas. Since 1946 RCA has installed many fully reliable Microwave systems, some over 1,000 miles long. *All have proved themselves in performance*—for utilities, government agencies, telegraph companies, turnpikes, as well as pipe lines.

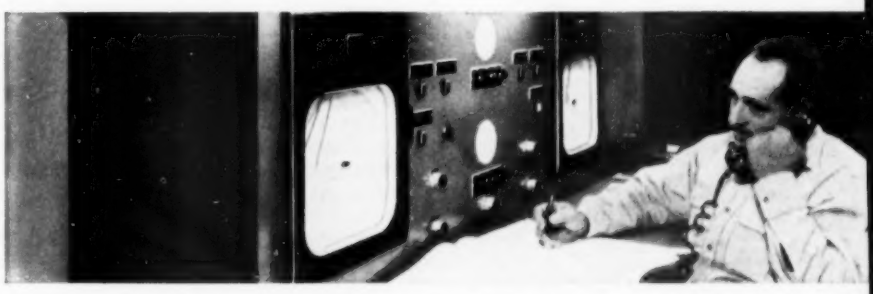
In addition to remote control and supervisory functions, RCA Microwave provides as many voice and teletype channels as you need—and does it with a minimum of frequency space. It employs readily available tubes and familiar circuits which are easy to service. It interconnects with your telephone lines and switchboards.

If you desire, RCA supervises survey, construction and installation—offers a complete single-source, single-responsibility service. And only RCA can provide the nationwide service facilities of the RCA Service Company.

For more information, mail the coupon ▶



Unattended booster station at Pernell, Okla. Radio-beam signals via RCA Microwave operate the booster by full remote control. Maintenance man inspects each station once every 24 hours.



Telemeter charts give continuous record of power and pressures at boosters. Operator remote-controls valves and pumps of booster stations. Signal lights indicate equipment failure and emergency generator operation. 2-way voice channel contacts maintenance personnel.

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT — CAMDEN, N. J.

Dept. 89VD, Building 15-1

Without obligation on my part, please send me your free booklet on:

☐ A Booster Station Microwave System ☐ Pushbutton Operation of Boosters

Name_____ Title_____ Company_____

Address_____ City_____ Zone____ State_____

☐ Have an RCA representative get in touch with me.

REPUBLIC'S 3-DIMENSION METALLURGICAL SERVICE

helps you solve your steel problems

• You may be trying to finalize the choice of grades of alloy steel for a new product . . .

Or wondering if your present product is taking full advantage of the alloy steels you are now using . . .

Whether it's a new product or a well-established one, you may be able to make it stronger or better or to reduce production costs by calling in a Republic Field Metallurgist to discuss problems of alloy selection and production with your metallurgical and manufacturing men.

The Republic Field Metallurgist is backed-up in his recommendations to you by a Republic Mill Metallurgist and a Republic Laboratory Metallurgist. Together they offer a complete and extensive consulting service to steel users . . . Republic 3-Dimension Metallurgical Service. Available to you through your local Republic Steel sales office.

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. . . combines the extensive experience and coordinated abilities of Republic's *Field*, *Mill* and *Laboratory* Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage. IT CAN DO THE SAME FOR YOU.

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Vogt

SCRAPED SURFACE *Exchangers*

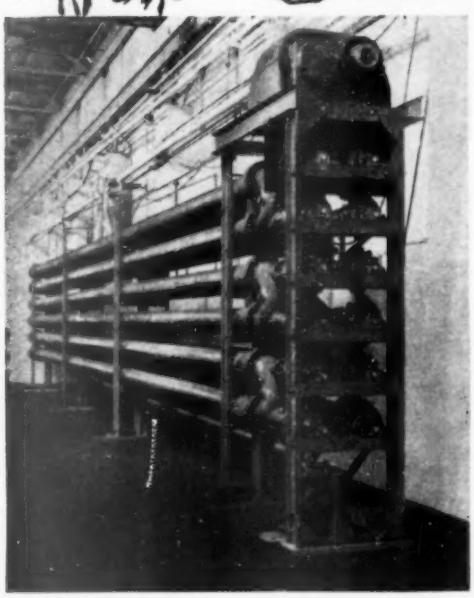
IF you are all "gummed up" with a tough heat transfer problem, Vogt Scraped Surface Exchangers will provide the answer. They have patented scraper elements which prevent fouling of the heat transfer surfaces and insure the highest rate of heat exchange between the product and the cooling or heating medium. The scrapers also continuously agitate the fluid and assist removal of solids from the unit.

DOUBLE PIPE EQUIPMENT is available in two types; EXCHANGERS, for cooling with water, brine, and cold filtrate, and for heating with steam or hot liquids; and CHILLERS, for use with volatile refrigerants such as ammonia, propane, and Freon. Both types have 8" jacket pipes and 6" inner pipes with scrapers.

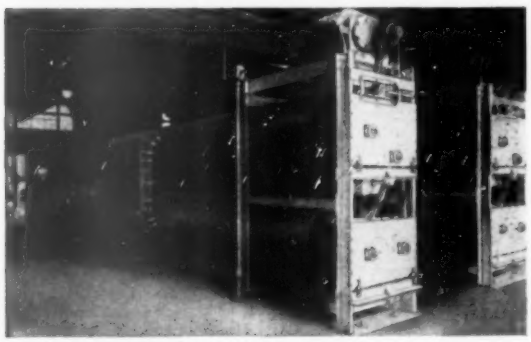
SHELL AND PIPE TYPE UNITS are designed for use with volatile refrigerants and for heating fluids with steam or similar heating mediums. They consist of large welded shells each containing seven 6" scraped pipe sections.

Vogt Scraped Surface Exchangers serve profitably as oil chillers, crystallizers, and heaters in many processes in the petroleum and chemical industries. Their application to your heat transfer problems will receive the prompt attention of our Engineering staff.

Write for Bulletin PE-1



*DOUBLE PIPE UNIT. Drive end close-up of 12 section unit under test in our shop.



*SHELL and PIPE UNITS. Two of five units installed in a leading petroleum refinery.

*Patented

HENRY VOGT MACHINE CO.

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Oil helps him harvest our lumber...

The legendary giant Paul Bunyan was a midget – compared to this man. For today's lumberman has more power than his famous forerunner ever had . . . he has *oil* working for him. Petroleum helps him cut, load, haul . . . helps him produce over 37-billion board feet of lumber per year.

From our forests come our homes and furniture . . . pencils and paper . . . thousands of other necessities. The Texas Company has long been a leading supplier of petroleum to America's lumber industry.

The Texas Company

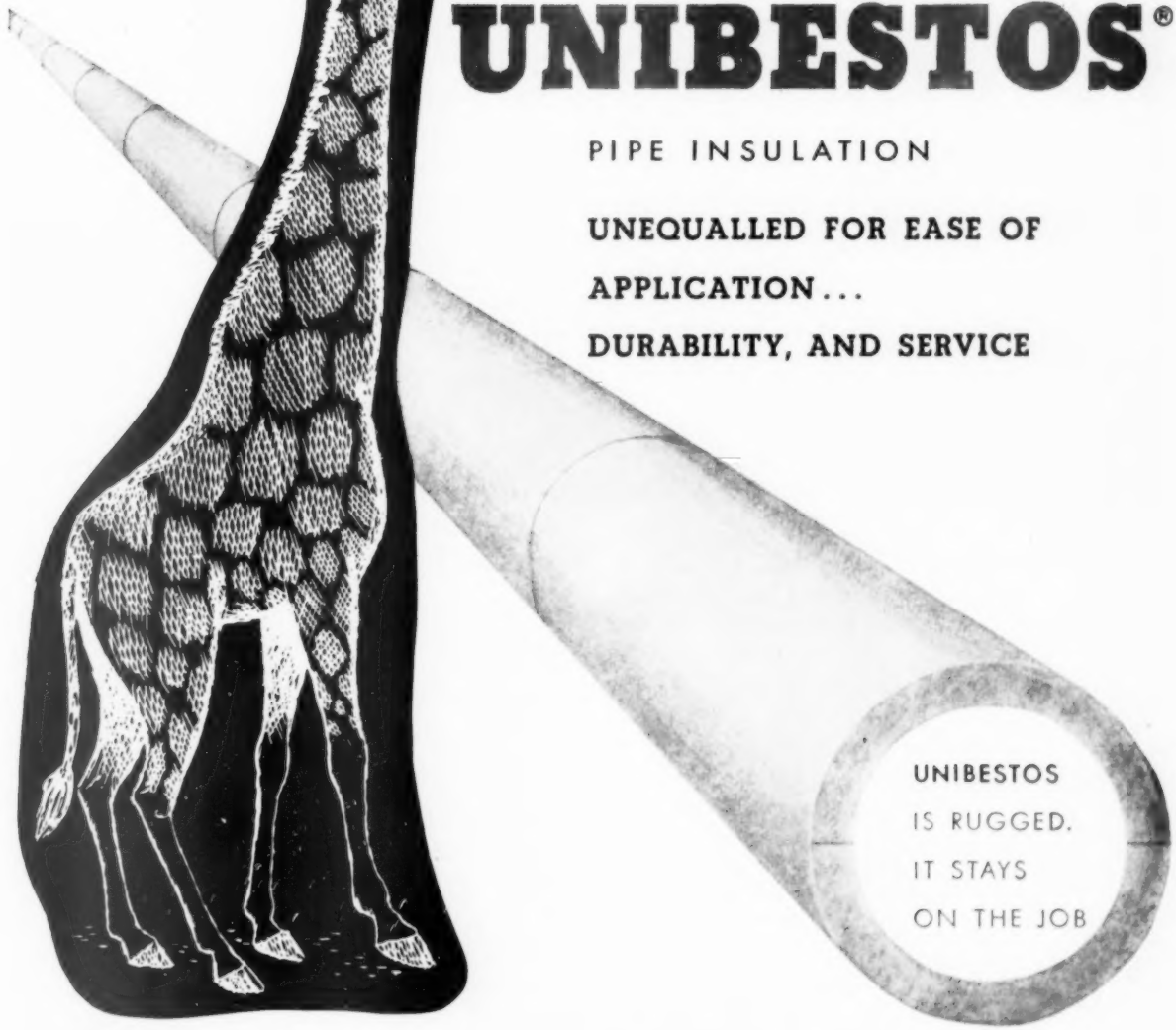
TEXACO

Takes Top Rating...

UNIBESTOS®

PIPE INSULATION

UNEQUALLED FOR EASE OF APPLICATION... DURABILITY, AND SERVICE



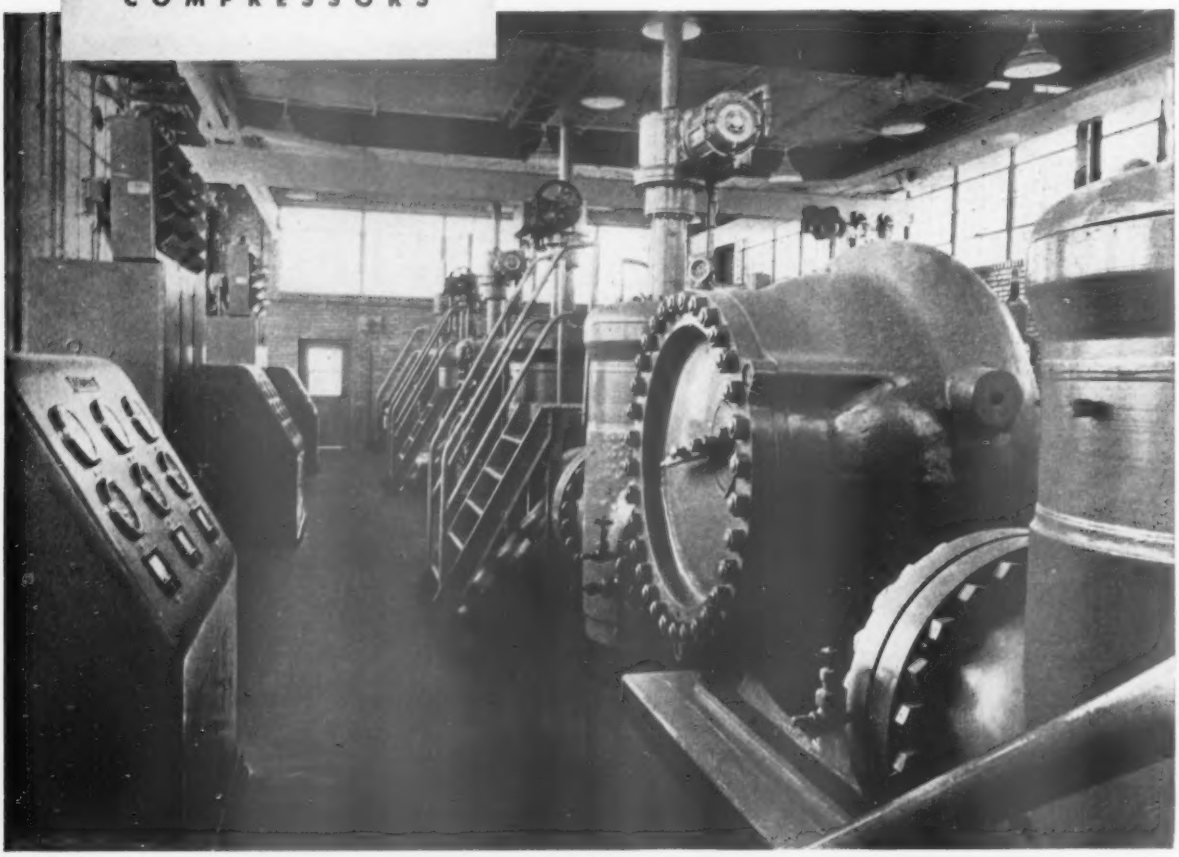
UNARCO

UNION ASBESTOS & RUBBER COMPANY

DEPT. E-10, 332 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

DE LAVAL
CENTRIFUGAL
COMPRESSORS

on the job at Texas Eastern



The centrifugal compressors on Texas Eastern Transmission Corporation's new 30-inch gas pipeline from Kosciusko, Mississippi, to Uniontown, Pennsylvania, are all De Laval.

Thirteen De Laval compressors will be installed in stations at Barton, Alabama; Gladeville, Tennessee (shown above); and at Wheelersburg and Berne, Ohio. Each station will be equipped with three 2,500 horsepower motor-driven compressors, except Berne, which will have four.

One of the outstanding engineering features of these compressors is the effective use of inlet guide vanes. This De Laval feature provides greater operating flexibility than has been previously possible with constant speed motor-driven units.

Once again De Laval engineering has led the way in developing better centrifugal compressors for natural gas transmission. If you want to know more about the advantages of De Laval centrifugal compressors—consult our engineers. They will be glad to give you the benefit of our wide experience on the major gas pipelines using centrifugals.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL 161

"SCOTCHRAP" saves 5-year-old pipe!

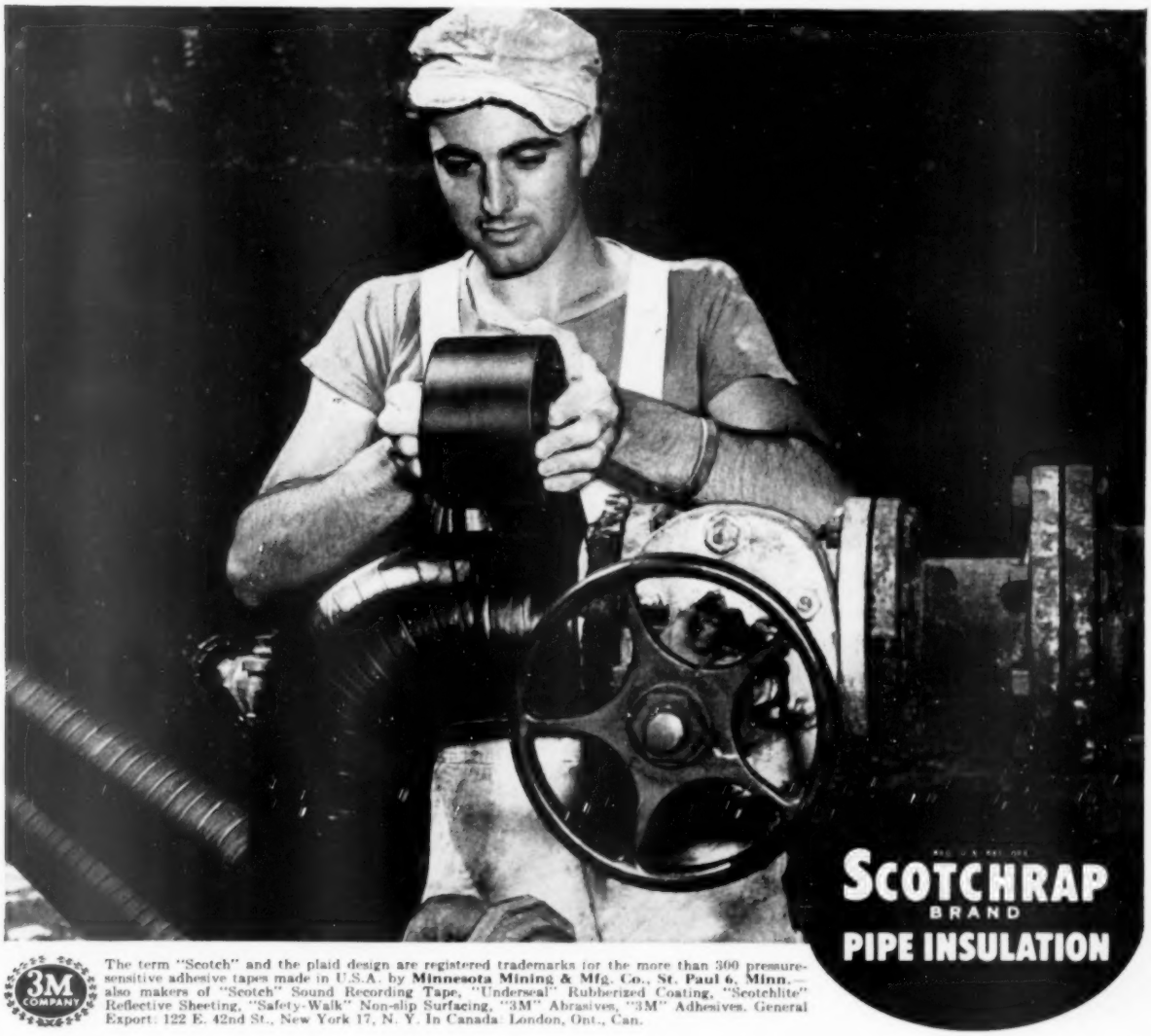
What could be easier? Just wrap worn and pitted pipe with "Scotchrap" Pipe Insulation and it's practically good as new.

That's what the workman is doing at the fuel oil tank farm shown above. And the pipe he's wrapping had been buried for five years.

What's more, "Scotchrap" protects the pipe *above* ground from weathering, snow, rain and corrosive atmosphere just as it protects *buried* pipe against galvanic and electrolytic action, earth acids, alkalies and oil.

"Scotchrap" is a tough polyvinyl chloride film with a pressure-sensitive adhesive that sticks tight and *holds*. It conforms smoothly, and it's a cinch to apply. No special equipment, no heating or activating.

"Scotchrap" is sold by the square in 1", 2", 4", 6" and 8" widths. Two thicknesses: 10 and 20 mils. Order a trial supply today, or write Minnesota Mining & Mfg. Co., Dept. OG-103, St. Paul 6, Minn., for more facts.



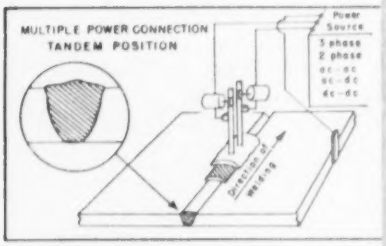
3M COMPANY

The term "Scotch" and the plaid design are registered trademarks for the more than 300 pressure-sensitive adhesive tapes made in U.S.A. by **Minnesota Mining & Mfg. Co., St. Paul 6, Minn.**—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N. Y. In Canada: London, Ont., Can.

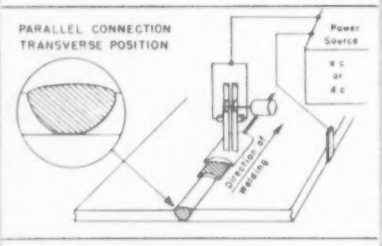
CUT YOUR WELDING TIME IN HALF *with* UNIONMELT Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

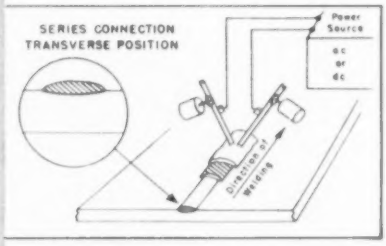
By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.



Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.



Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

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A Division of Union Carbide and Carbon Corporation
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In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

Linde TRADE-MARK

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They Say—

Gas Regulations . . .

. . . Hamper Industry

"The industry has been burdened in certain quarters and at certain levels with onerous, exacting, and expensive regulatory requirements, some of which clearly invade the prerogative of management, and others duplicate each other to the ultimate disadvantage of the public, whose interests are presumably supposed to be served. In the regulatory of governmental field, we note with deep concern on our own behalf, and on behalf of the public, a persistent and vigorous effort to regulate the production of gas contrary to the provisions of the applicable statutes and to the obvious discouragement of exploration."

James F. Oates, Jr., chairman of Peoples Gas Light & Coke Co., in an address to the Independent Natural Gas Association of America annual meeting, Houston.

. . . Help Industry

"There have been complaints, some or many of which may be justified, of oppression, too much regulation, and similar criticism. Nevertheless, a certificate of convenience and necessity from the Federal Power Commission to construct a natural-gas pipe line in a certain place has been accepted by investors as pretty good assurance that the project was feasible and that there would not be unexpected and ruinous composition from some unknown pipeline company which would suddenly appear to serve the same market. Although utility regulation has developed and exists in this country for the primary purpose of protecting the public interest, as distinguished from the utility, nevertheless the utility receives some benefits along with burdens imposed."

Jerome K. Kuykendall, chairman of the Federal Power Commission, addressing the annual convention of the Texas Mid-Continent Oil and Gas Association, Houston.

Journal Article May Get Results

Sir:

I have looked for a strong editorial in The Oil and Gas Journal which would read like a Sermon on the Mount, but it has not been forthcoming. However, the factual article by John Casper in the last issue (September 21, page

BEMIS GRAVITY PACKER . . . for fast economical weighing, filling and closing of multiwall paper bags. One- or two-man operation. Speeds—up to 12 bags per minute—either 50-lb. or 100-lb.

Your Three Steps to an Efficient, Economical Petrochemical Packaging Operation

BEMIS MULTIWALL PAPER BAGS . . . tailored to your requirements. Bemis' twelve multiwall plants are located to give you unexcelled service.

BEMIS PACKAGING SERVICE . . . for specialized aid in plant layout, installation, etc. Our trained Factory Representatives are at your call for any type of packaging help.

Other Bemis Bags for the Oil Industry . . . Bemis is a supplier of all types of bags for the oil industry: Wax bags—either cotton-lined burlap or waterproof (laminated-textile) bags—core sample bags, etc.

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about Bemis Packaging Service ☐;
about Bemis Bags for _____ (product) ☐.

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The fastest wrench you can put in the hands of a maintenance or production worker. Swiftly runs nuts or screws on or off—cuts costs—makes tough jobs easy. The Snap-on impact wrench delivers up to 2,000 powerful rotary blows a minute without twist or hammer shock to operator. Sets nuts solidly, or quickly reverses to break tough ones loose. ½" square drive takes sockets ⅜" to 1 1/16"—many accessory tools available. 2 models—115 volts, 220/230 volts. Available through Snap-on factory branch warehouses in principal industrial centers. Write for Snap-on Industrial catalog and new catalog of 4,000 hand and bench tools for production and service.

SNAP-ON TOOLS CORPORATION
8098-J 28th Ave., Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation.

148) has, in my judgment, been almost as effective as a strongly worded editorial from the leading oil journal in the world.

In my recent peregrinations, I have heard everywhere the suggestion by people in the industry that something should be done, that there should be substantial cutbacks in oil production and refinery output, but only since the article referred to have I heard comments that indicated the individual companies concerned were doing or going to do something about it. . . .

Emby Kaye,
Tulsa.

Gas, Products Demands to Rise

"We . . . expect residual fuel demands to show a decline but think that gasoline and distillate will go up.

"Gasoline demand growth will not be affected unless people really feel hard up. Distillate demand should increase substantially because of larger heating requirements.

"Exports of crude oil and refined products are expected to decline. Marketed production of natural gas will be close to 12 trillion cubic feet by 1958, representing a 50 per cent increase over 1952.

"That by 1958, petroleum demand can be expected to average about 10,400,000 bbl. daily, 27 per cent higher than this year."

John G. Winger, petroleum economist for Chase National Bank, addressing the annual meeting of the Louisiana-Arkansas division of the Mid-Continent Oil & Gas Association, New Orleans.

Let Industry Troubles Be Known

". . . dwell on the fact that you and thousands of others by your own free selection have found for yourselves an economically useful niche in a distribution system that for tonnage and uninterrupted continuity is not matched by any other industry either in this country or anywhere else in the world. Think about it and then go out and tell somebody about it. You might point out . . . that many of our seeming front page troubles are the direct result of an industry willingly and deliberately overbuilding its refining capacity by 800,000-bbl. days in the interest of national defense and in response to a government request.

"You can have a profound satisfaction in being identified with an industry, which through supplying lubricants and power and heat, has remade our world. Point out that this dramatic development could not help but create problems new to our society and to our lawmakers.

"Among the many day to day prob-

Plenty of heart for tough jobs!

New Model RPF-190 Series with LPG fuel system. Gasoline and diesel power also available.

The heart of the 6-wheel truck is the *bogie*. INTERNATIONAL's bogie has been performance-proved on the tough jobs. Proved beyond a doubt by INTERNATIONAL'S 18 straight years of 6-wheel sales leadership.

INTERNATIONAL brings you this advanced bogie design in *America's most complete line of 6-wheelers*—the widest choice, by far, of models, engines, transmissions, and axle ratios. No other 6-wheelers provide such exact truck-to-job specialization!

Ask your INTERNATIONAL Dealer or Branch for all the facts—and a demonstration. Time payments arranged.

INTERNATIONAL HARVESTER COMPANY · CHICAGO

OUTSTANDING ADVANTAGES OF THE INTERNATIONAL BOGIE

The third differential and power divider allow each wheel to rotate independently. There is practically no tire scuffing, "axle fight," or power loss. Perfect matching of tires is unnecessary. Fuel consumption is lower. Under adverse conditions, the third differential can be locked out, giving positive traction on all wheels.

Abnormal tire wear eliminated because INTERNATIONAL bogie design *always* keeps wheels parallel to frame.

Reduces road shock by 50%. "Walking action" design keeps chassis frame and body level while bogie "walks" over obstructions and levels out the road.

Extra strength without extra weight. More payload per pound of chassis weight results from elimination of unnecessary dead weight. Strength is concentrated where needed.

Load stresses equalized. Load is carried from the frame to the axles at *four* points.

23 NEW 6-WHEEL MODELS

GVW ratings, 22,000 to 90,000 lbs. Engines from 130 to 356 horsepower. Choice of gasoline or LPG fuel systems. Diesel engines available for models with GVW ratings of 30,000 lbs. and over. Transmissions and axle ratios to meet any requirement. America's most complete truck line—170 basic models from ½-ton pickups to 90,000 lbs. GVW off-highway models.

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Better roads mean a better America

INTERNATIONAL® TRUCKS

"Standard of the Highway"

How to SPEED UP Your Spread.....

The Bucyrus-Erie Way

With fast, smooth-working Bucyrus-Erie TD-24 Bullgraders, bulldozers or tilting bulldozers clearing the way out ahead of you and putting the pipe to bed behind you, it's easier to keep your spread moving at a fast, steady pace. Built from the ground up for use with the powerful International TD-24 tractor, these Bucyrus-Eries provide the balance, strength, and control to take full advantage of the tractor's weight and power.

Here's what they can do for you on pipeline construction:

1. PIONEERING THE WAY For driving the opening wedge you can't get a more efficient land clearer. Bucyrus-Erie Bullgraders and bulldozers are built to concentrate maximum tractor power at the blade. Their high-lift blades power out trees and stumps, roll dirt and rock off the right-of-way, and rough grade the ground fast.

2. BACKFILLING Scientifically curved blades roll the dirt back into the trench instead of pushing it. This 'live-load' action means less fuel burned, more feet of trench per hour. One man easily angles or tilts the Bullgrader blade in a jiffy.

3. CLEANING UP THE JOB Accurate blade control makes it simple to smooth out the grade in a hurry. Constant, full power is instantly available with the improved planetary drive winch. Fast cable response enables the operator to feel blade movements. A single lever controls both brake and clutch, saves time and effort.

Bucyrus-Erie Bullgraders, bulldozers, and tilting bulldozers are sold and serviced by International Industrial Tractor Distributors, located at many points throughout the United States and Canada. See your distributor for complete information. 27753

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See Your INTERNATIONAL Industrial Tractor Distributor

lems of the petroleum industry, two stand out above the rest deserving not only our attention but our best thought and study for many years to come. These are (1) the gigantic task of expansion as the fact that this is a petroleum age becomes more and more apparent, and (2) the relations with government and society which, for a variety of reasons, are too often strained."

R. H. Collacott, assistant to the chairman of Standard Oil Co. (Ohio), addressing the Tennessee Oil Men's Association, Knoxville.

Iran's Oil Industry in Deep Hole

"Besides the lost markets and the lost revenue resulting from the action by the government of former Premier Mossadegh, the Iranian oil industry is more than $87,000,000 in the red, and it will cost from $40,000,000 to $50,000,000 to restore the Abadan refinery to the productive capacity it had before nationalization. On top of this, the premier said, foreign experts will have to be invited to return to supervise the work.

"The total income from Iran's oil industry since it was taken over by the government has been less than $2,000,000. Maybe some Iranians still think it was a smart thing to do, but it does not look that way from this distance."

Editorial in the Houston Post.

CALENDAR OF EVENTS

OCTOBER

19-21 American Institute of Mining and Metallurgical Engineers, petroleum branch, fall meeting, Dallas.

19-20 Independent Petroleum Association of America, annual meeting, Texas Hotel, Fort Worth.

19-23 National Safety Congress, annual meeting, Hotels Conrad Hilton, Congress, Harrison, and Sheraton, Chicago.

21-23 Gulf Coast Association of Geological Societies, third annual convention, Captain Shreve Hotel, Shreveport.

22 American Institute of Chemical Engineers, New York section, symposium, Hotel New Yorker, New York

22-23 Western Petroleum Refiners Association, regional meeting, Garrett Hotel El Dorado, Ark.

23 Natural Gasoline Association of America, regional meeting, Blackstone Hotel, Tyler, Tex.

26-28 National Lubricating Grease Institute, Edgewater Beach Hotel, Chicago.

26-29 American Gas Association, annual conference, Kiel Auditorium, St. Louis

27 Institute of Gas Technology, annual meeting, Chase Hotel, St. Louis.

27 Association of Consulting Chemists and Chemical Engineers, Inc., annual

Ready for you after 12 months of brutal

CUSTOMER TESTING!

CLARK's

New and Exclusive

HYDRATORK DRIVE*

Here's how it improves your fork-truck operation:

1 **MORE WORK:** faster get-away, positive power without slippage; moves heavy loads and climbs ramps with ease.

2 **LOWER COST:** higher percentage of "on-the-job" time results from no clutch problems, "cushioning" effect on motor and drive members.

3 **GREATER SAFETY:** hydraulic brake system, linked to torque converter, automatically cuts power; engine cannot be started unless controls are in neutral.

4 **IMPROVES DRIVER EFFICIENCY:** finger-tip direction control and elimination of gear-shifting conserves operator energy.

Not one, but *eighteen* HYDRATORK-equipped trucks were placed in customers' plants for a full year of on-the-job testing. Without exception, these units proved that reduction in driver fatigue and of truck downtime results in greater production from HYDRATORK-equipped trucks.

1903 1953 CLARK EQUIPMENT

* *Now available in 6-7000 lb. capacity truck*

Mail the coupon for detailed literature which explains how CLARK's new and exclusive HYDRATORK DRIVE operates.

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AND POWERED HAND TRUCKS - INDUSTRIAL TOWING TRACTORS

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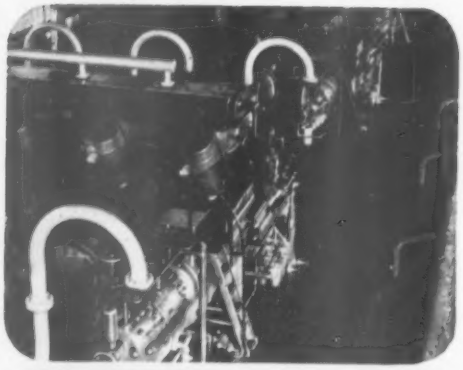
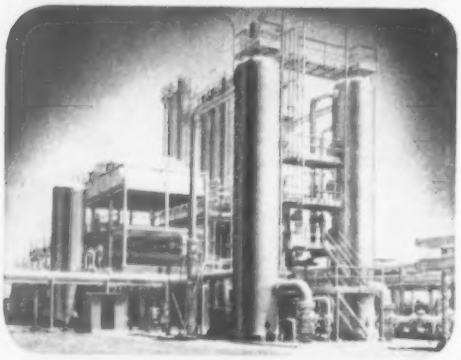
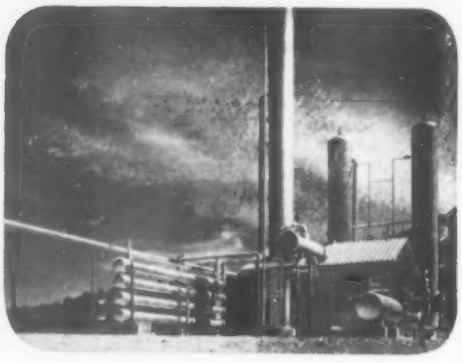
unitized compressor stations . . . . . .



efficient dehydration units . . . . . .



amine-type desulphurization plants . . . . . .



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SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES

meeting, Hotel Belmont Plaza, New York City.

28-30 Seventeenth Technical Conference on Petroleum Production, Mineral Industries Building, Pennsylvania State College, State College, Pa.

29-31 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver

30-31 South Texas Geological Society, annual fall field trip, San Antonio.

NOVEMBER

3- 4 Society of Automotive Engineers, national diesel-engine meeting, Conrad Hilton Hotel, Chicago.

5- 6 Society of Automotive Engineers, national fuels and lubricants meeting Conrad Hilton Hotel, Chicago.

5-6 American Association of Petroleum Geologists, Pacific section, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists annual joint meeting, Hotel Biltmore, Los Angeles.

6- 7 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

9-11 Geological Society of America, annual meeting, Royal York Hotel, Toronto, Ont.

9-12 American Petroleum Institute, annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

12-13 Society of Exploration Geophysicists, midwestern meeting, Adolphus Hotel, Dallas.

19-20 National Association of Corrosion Engineers, western region, fall conference, Biltmore Hotel, Los Angeles.

19-20 Annual Instrument Short Course, Los Angeles Harbor Junior College, applied technology division, Wilmington, Calif.

20 Natural Gasoline Association of America, regional meeting, Herring Hotel, Amarillo, Tex.

Nov. 29-
Dec. 2 American Society of Mechanical Engineers, Statler Hotel, New York City.

DECEMBER

1- 4 Corrosion conference, University of Oklahoma, Norman.

13-16 American Institute of Chemical Engineers, annual meeting, Hotel Jefferson, St. Louis.

JANUARY

11-15 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler Hotels.

12-14 National Constructors Association, annual meeting, Hotel Commodore, New York City.

FEBRUARY

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

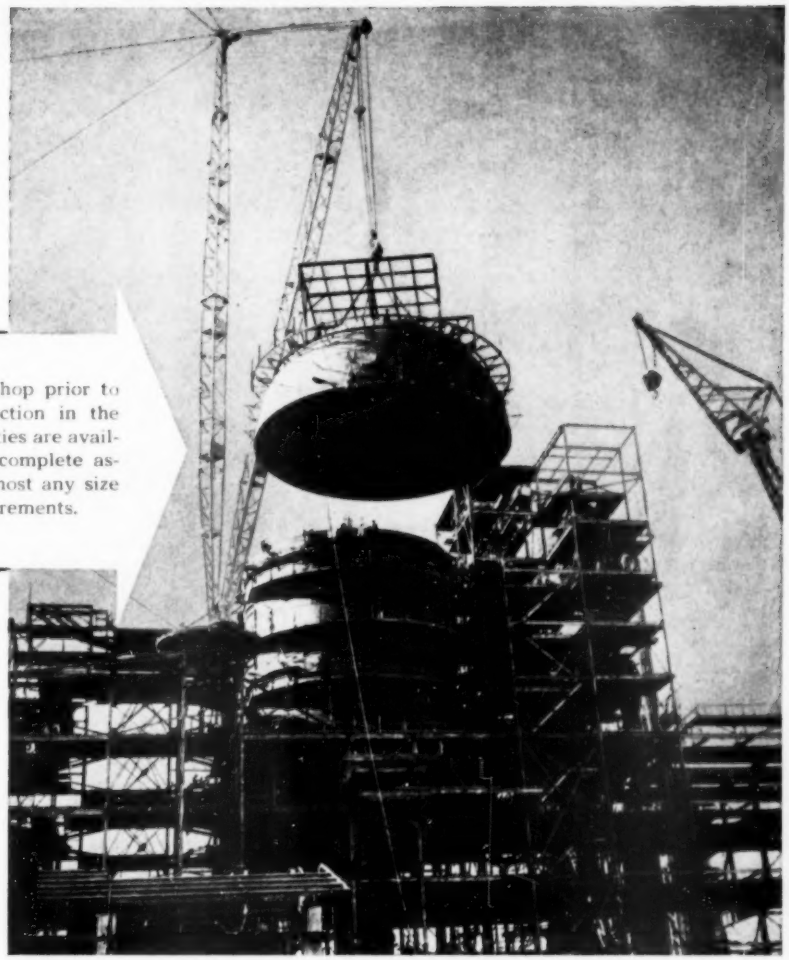
1- 5 American Society for Testing Materials, spring meeting, Shoreham Hotel, Washington, D. C.

3- 5 American Petroleum Institute, Division of Production, Southwestern district, Rice Hotel, Houston.

4- 5 American Gas Association, transmission and storage conference, Jung Hotel, New Orleans.

8-10 American Institute of Chemical Engineers, Statler Hotel, Washington.

17-19 American Petroleum Institute, Division of Production, Mid-Continent district, Skirvin Hotel, Oklahoma City.



Precision assembly in the shop prior to shipment expedites construction in the field. Cranes and other facilities are available at Newport News for complete assembly of weldments of almost any size to meet the customer's requirements.

Shipbuilder "launches" new vessel

It's a pressure vessel in an overseas petroleum refinery. And it caps *sixty-seven* years' experience by the Newport News Shipbuilding and Dry Dock Company. Sixty-seven years, building just about any kind of vessel you could name. And at a price.

They've fabricated millions of tons of steel. They handle weldments in almost any size or shape. They machine, weld and stress relieve.

Another development: fabrication of corrosion-resistant alloy, clad, and other special steels. You know how important they are today.

What's more, there's plenty of equipment – foundry, machine shop, fabrication and erecting – to build anything from a cat cracker to a bubble tray. And enough engineering skill and shop force experience to handle the job as you want it done. And at reasonable cost.

It would pay you to ask yourself, "What could Newport News build for us?" Find the answer in the brief, easy-to-read, photo-and-caption pages of *Facilities and Products*. See for yourself what Newport News is doing. And what equipment they use.

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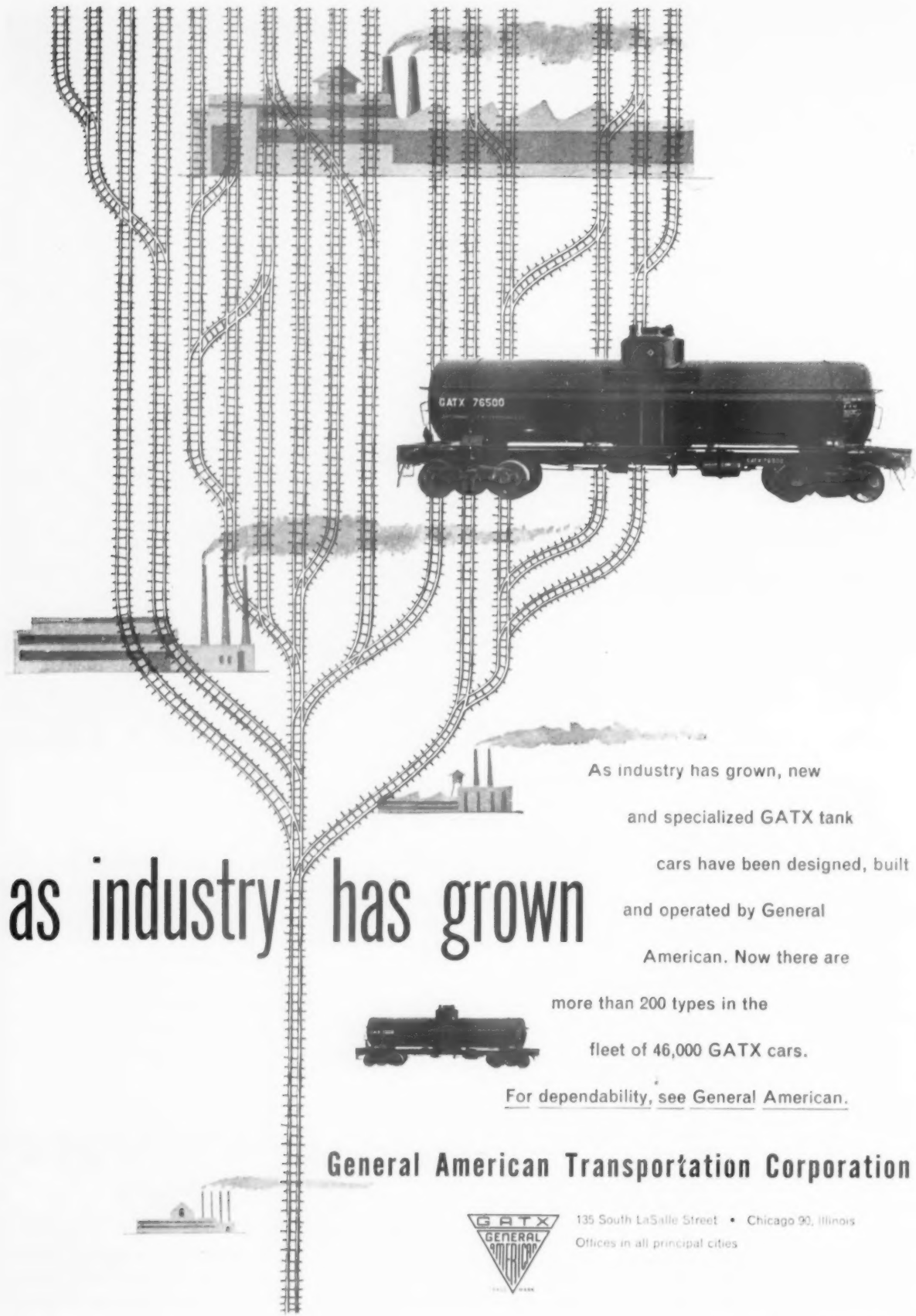

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JOURNAL
TULSA, OKLAHOMA

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JOURNALLY Speaking

Wyoming Oasis

WHO says you can't have your cake and eat it too? You would have a hard time convincing the people in Sinclair, Wyo., that there is any truth in this old saw. Here's what they have:

- Modern, up-to-date housing, at nominal rent.
- Varied, year-'round recreation—at $10 per family.
- A full program of activities for children and youth—at no personal cost.

Sinclair is a vividly green oasis out in a semiarid region in South Central Wyoming. Its sole reason for existing is, as you've probably guessed by now, Sinclair's refinery at that location.

Population of the little city is 742, plus or minus one or two souls, as we go to press. Well over 95 per cent of these people rent housing from Sinclair Refining Co. which owns the town, as well as the refinery, lock, stock, and barrel. Sinclair also operates all utilities, telephone, fire, and police departments. Cost for these services is ridiculously low.

The community is not just another oil camp, either. Houses are of various sizes and varying styles of architecture. Some of the dwellings are brick, some are built with asbestos siding, and some are of trim white frame construction. There's not a leaking faucet or an unpainted window frame in town. Some 8 to 10 maintenance men are assigned full time to keep the houses in apple-pie order.

Good fishing . . . A scant 6 miles from town is, say the natives, the finest trout stream in Wyoming, the North Platte River. The best golf course in Wyoming, maintained by two Sinclair employes, meanders in and out of the cottonwood trees along the North Platte's banks, and a fine recreation area replete with picnic and playground equipment adjoins the golf course.

Just to the left of the first tee is a fine club house of brick construction which was put together by members of the golf club.

Dues for family membership in the club for 1 year amount to $10.

The Sinclair company underwrites or provides outright a number of recreational facilities in the town itself. There is a playground with tennis courts, swings, slides, and archery equipment. There is a gymnasium used variously for basketball, as a rifle range, and for square dancing as the occasion demands. A theater is operated during the winter months when the residents come indoors for a spell. Sinclair has set up a bowling alley, complete with four of the most modern and elaborate alleys available. The Sinclair-backed town athletic association sponsors a junior baseball team, two junior basketball teams, teen-age dances, and a skating rink.

Youth activities . . . Sinclair provides facilities for scouting, cubbing, and campfire activities. Every boy in town of eligible age belongs either to the scout troop or is enrolled in the cubbing program. All eligible girls participate in the campfire activities.

The company also provides a town library.

One of the best and most modern hotels in Wyoming is owned and operated in the town on U. S. Highway 30 by Sinclair. Facilities are available to tourists, as well as Sinclair Co. visitors, at nominal rates.

Sinclair is only hours away from some of the prettiest scenery in the United States. Yellowstone and Grand Teton National Parks can be visited on a week-end excursion to the north. Estes Park, Boulder, Denver, and Rocky Mountain National Park can be reached in half a day's driving to the south.

A spirit of friendliness and neighborliness pervades the small community, and a strong loyalty to Sinclair is evident to all who visit there.

Just another example of how the nation's oil companies are head and shoulders above industry in general in looking after the health and well being of their personnel.

—Gerald L. Farrar.

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Conservation has become a mockery in Oklahoma

OKLAHOMA'S Corporation Commission is open to a charge of arbitrary and capricious administration of the state's oil-conservation laws in its recent edict that a crude purchaser or pipe line must take the exact allowable production from every connected lease.

Oil buyers agree that the order is undoubtedly illegal, though so far none has initiated a court test. They also describe it with other adjectives, such as impractical, unworkable, punitive, vindictive, and words unsuitable for public print.

As explained on page 82 of this issue, the order disregards the facts of the oil business, jeopardizes the welfare of the producers it purports to protect, and makes mockery of the conservation laws on which it assumes to rest.

STANDING by itself, the order might be viewed as one of those ill-considered actions any regulatory body is apt to take on occasion and which causes only temporary difficulties until corrected. But this action is one more manifestation of a steady deterioration in the administration of Oklahoma's conservation laws which has been going on for some time.

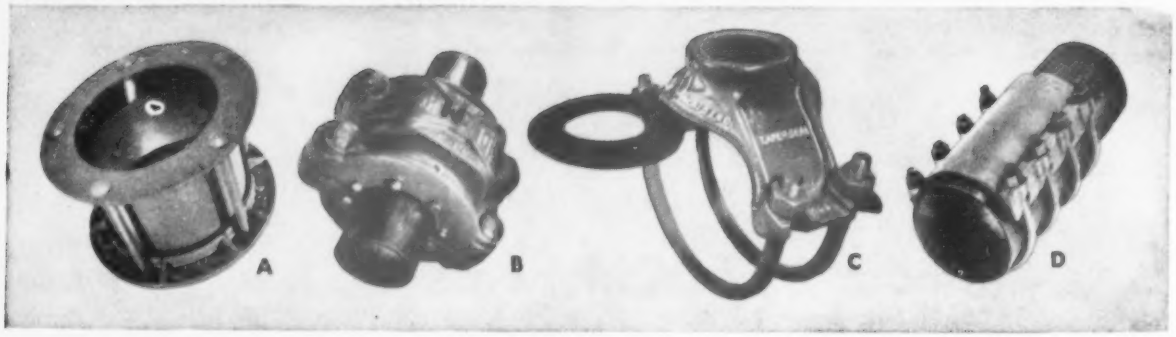
It has become a byword in the industry that Oklahoma has the best set of conservation statutes in the country but the most inefficient and lackadaisical regulatory body. Oklahoma, the mother of oil conservation, the fourth largest producing state, the erstwhile model for the world, has let its conservation efforts degenerate to where it is at the bottom of the list and the laughingstock of the industry.

The laxity of conservation administration in Oklahoma can be seen by contrasting the technical, statistical, and enforcement work here with that in other states and in the commission's procedural methods, field work, and record keeping. Operators say the commissioners pay little attention to the oil part of their work, with the result that conservation is administered largely through personal contact with the staff—a condition which could arouse suspicions of favoritism and political influence.

OKLAHOMA pioneered with a market-demand statute, but the commission consistently sets allowables higher than nominations although other states habitually do the reverse. Oklahoma's actual production is usually some 10 per cent above allowables, while Texas, to cite one example, usually produces about 8 per cent under allowables. These facts suggest that proration has become a fiction in Oklahoma.

Oklahoma operators generally deplore this situation. Why don't they do something about it? Don't they really care about conservation? Are they too polite to offend anyone?

Whatever the cause, it's time somebody mustered the guts to expose and clean up this mess.



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widen demand for DUCTILE IRON

in pipe line applications

DUCTILE IRON . . . a revolutionary metallurgical development . . . combines the process advantages of cast iron with the product advantages of cast steel.

Tensile strength of DUCTILE IRON greatly exceeds that available in gray iron. Values in excess of 150,000 psi may be attained by heat treatment. DUCTILE IRON parts resist permanent deformation at higher pressures because of their higher yield strength.

Superior pressure tightness is available in DUCTILE IRON because of its metallurgical structure. Therefore, fittings withstand higher hydrostatic pressure before leakage occurs.

DUCTILE IRON parts can be economically produced because of its excellent machinability and its ability to be cast readily into intricate shapes.

Some Unique Properties of Ductile Iron

1. Its elastic modulus, about 25,000,000 psi, is virtually unaffected by composition or thickness . . .

2. Ductile Iron of 93,000 psi tensile strength, as cast, has the same machinability rating as gray iron with a strength of 45,000 psi.

3. Annealed Ductile Iron can be machined at a rate 2 to 3 times that of good quality gray iron.

4. It can be satisfactorily welded.

5. It resists oxidation and growth to an extent never before available in gray iron castings.

6. It can be cast in intricate shapes not normally feasible for cast steel.

(A) Ductile Iron Flexible Coupling . . . available in pipe sizes from ½" and up . . . with strong yet light weight flanges that prove more durable than those made of cast iron. Special corrosion-resisting finishes provide a connecting unit that assures long-lasting, positive seal.

(B) Ductile Iron H.O.V. Split Coupling . . . a type widely used directly over existing couplings on pipe lines carrying gasoline. Utilizing both mechanical and hydraulic pressures for sealing, this type withstands pressures exceeding 1300 psi.

(C) Ductile Iron "Tapping Saddle" or Double Strap Service Clamp . . . showing Smith-Blair design designated as "taper seal" . . . available in 2" to 20⅛" O.D. sizes. Utilizes internal pressure to seal tightly. Ductile Iron provides strong, durable, flexible and economical clamp.

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Shown here are examples of pipe line equipment designed and manufactured by Smith-Blair, Inc., of South San Francisco, utilizing Ductile Iron castings produced by the Vulcan Foundry Company of Oakland, California.

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THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

THIS WEEK... ...IN THE NEWS

BIGGEST SINGLE EVENT of Oil Progress Week was the dedication of the 718-mile, 24-in. Trans Mountain Oil Pipe Line Co. crude line from Edmonton, Alta., to Vancouver, B. C. Construction of the line, one of the roughest pipe-line projects ever attempted, was completed in 20 months—remarkably short considering the severity of the weather and the ruggedness of the terrain. Pipe-line gangs were confronted with a lot of country like this while crossing the Canadian Rockies and the Cascades. Roughest parts of the entire job were in Coquihalla Canyon east of Hope, B. C., and in the Jasper, Alta., area.

INTERNATIONAL — Current reports in both Britain and Iran that the two governments may enter into direct negotiations make it appear even more likely that an early settlement of the Anglo-Iranian nationalization controversy is forthcoming. . . . Meanwhile, Anglo-Iranian continues to press its legal fights in both Italy and Japan for payment of Iranian oil shipped into the two countries. . . . ¶The world's largest crude pipe line is in service on the Persian Gulf. . . . Kuwait Oil Co. puts into operation the 5½-mile, 34-in. gravity-flow line from a tank farm to a tanker terminal at Mina al Ahmadi. . . .

NATURAL GAS—Supreme Court announces it will pass on constitutionality of Texas' gas-gathering tax. . . . Decision expected within a few months, permitting disposition of about $27,000,000 in protested payments now tied up. . . . ¶Kansas Corporation Commission asks Supreme Court to review lower court ruling that FPC can refuse to consider Kansas' minimum well-head price in determining rates of Northern Natural.

PRODUCTION—The Oklahoma Corporation Commission order aimed at ending "pipe line" proration comes under fire as crude purchasers label the order both illegal and unworkable. . . . Most purchasers and pipe-line companies take a dim view of the order, but none appears ready to test its legality in court. . . . ¶Cities Service Oil Co. is making preparations for the world's deepest water flood in a 720-acre block in McClain County, Oklahoma. . . . The operator plans to flood the Bromide sandstone at 11,000 ft. . . . ¶Shell Oil Co. sets a new mark for the world's deepest producer with its 2 Gonsoulin-Minville in Iberia Parish on the Louisiana Gulf Coast. . . . The well was completed through perforations from 17,260-17,306 ft.

PIPE LINES—Trans Mountain celebrates completion of 718-mile, 24-in. crude trunk from Edmonton, Alta., to Vancouver, B. C., in dedication ceremonies at Vancouver. . . . Construction of the line, one of the roughest projects in history, has sparked the rise of major new refining area in Vancouver district which will force wholesale revamping of West Coast marketing patterns. . . . ¶Contract for 400 miles of 10 and 12-in. products line from Duncan, Okla., to West Memphis, Ark., let to River Construction Corp. by Oklahoma-Mississippi River Products Line, Inc. . . . ¶Evangeline Pipe Line System opens 191-mile, 16-in. products carrier from Port Arthur, Tex., to Baton Rouge. . . .

ACTIVITY—Production of crude and lease condensate averaged 6,296,450 bbl. daily for week ended October 10, down 115,425 bbl. daily. . . . Total well completions for the week increased 90 wells to 1,059. . . . Wildcat completions totaled 251 compared with 170 for preceding week and 255 for same week last year. . . . Rotary rigs operating in the United States on October 12 totaled 2,703, the first report with a total above 2,700 since last December. . . .

TRENDS—Total well completions this year through October 10 represented an increase of 1,972 wells over drilling for the same period last year. . . . Oklahoma accounted for about 66 per cent of the increase with a gain of 1,295 wells. . . . Wildcat completions through October 10 were up 563 wells over last year. . . .

Despite Mountains . . .

Tough Forests . . .

And Miles of Rock . . .

Trans Mountain Finishes Big Line

Company celebrates completion of one of industry's most difficult projects, opens Alberta outlet to West Coast

VANCOUVER, B. C. — Completion of what is generally conceded to be the toughest major pipe-line construction job ever undertaken was celebrated here October 15 in ceremonies dedicating Trans Mountain Oil Pipe Line Co.'s 718-mile, 24-in. crude trunk from Edmonton, Alta., to Vancouver.

Initial capacity of the big line is 150,000 bbl. daily. Design is such that capacity can be expanded to 200,000 bbl. daily by adding two pump stations to the present four.

Construction of the line, as well as providing a new and vital outlet for the growing crude production in Alberta, is resulting in the creation of a new refining center in the Vancouver area and a major shift in the marketing pattern over the entire West Coast of the United States and Canada. New refineries are being erected at Kamloops, B. C., by Royalite Oil Co., Ltd., and at Anacortes, Ferndale, and Seattle, Wash., by Shell Oil Co., General Petroleum Corp., and Pacific Oil & Refining Co., respectively. Shell and Imperial Oil, Ltd., are expanding substantially their refineries at Shellburn and Ioco, B. C.

Construction . . . First actual construction on the line began in February 1952. Before it was completed, the project, with considerable justification, was being called the "Ripley Believe It or Not" line, and the "Inch-by-Inch" line, among others.

All but 55 miles of the route parallels a transcontinental railway. Over the first 510 miles from Edmonton to Kamloops it follows the Canadian National, then crosses 55 miles of open plateau, follows the Canadian Pacific for 67 miles, then back to the Canadian National for the last 86 miles.

The line crosses nearly every conceivable type of terrain except desert—mountains, forests, plains, and surprisingly, even swamp.

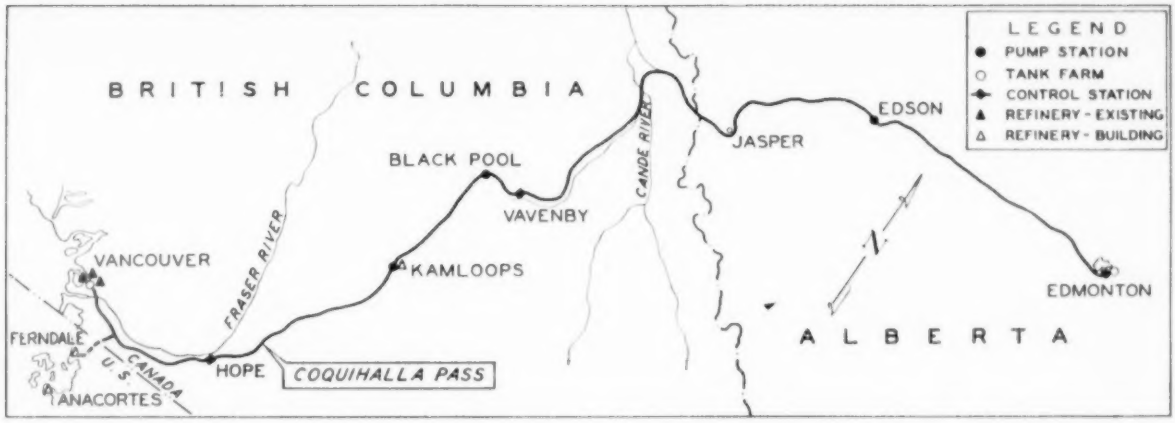
The two most formidable stretches of terrain were in the Coquihalla Canyon east of Hope, B. C., and in the Jasper, Alta., area, where the work sometimes resembled chimney building more than pipe lining. Here, common mountain pipe-lining practices of laying lines along the tops of ridges or crossing over from one valley to the next were impossible because of the alpine nature of the mountains.

No other project has been built with such long side-hill cuts. These cuts totaled 135 miles on the entire 718-mile project, and single cuts extended for as much as a mile.

Timber in some areas was so dense that trees had to be cut with power saws to fall inward. One gang used 20 bulldozers—thought to be an all-time high. Terrain near Jasper and in Coquihalla Canyon was so rugged that nearly 100 per cent of the ditching had to be done with back hoes; there was little chance for a ditching machine.

The line makes 72 stream and river crossings, 56 highway crossings, and 24 crossings of the two railways.

Pipe is buried throughout the route



to circumvent damage by landslides and snowslides and to insulate against low temperatures. Cover ranges from 24 in. in rocky areas to 36 in. on the prairie where severe winter temperatures prevail. Corrosion is considered a minor problem, but the line is coated and wrapped with coal-tar primer, coal-tar enamel, glass fiber, and impregnated felt.

Pump stations . . . The four pump stations on the system are located near Edmonton, Edson, and Black Pool, Alta., and at Kamloops, B. C. When expansion of system capacity to 200,000 daily becomes feasible, pump stations will be built at Gainford and Jasper, Alta.

Pump horsepower totals 19,800 at the four stations. The Edmonton station has three dual-fuel, 1,760-hp. engines operating principally on natural gas and 8 by 10, 5-stage centrifugal pumps. Main units at Kamloops are similar except that the engines are equipped only for liquid fuel. The Black Pool station, to be completed in December, contains equipment similar to that at Kamloops. At Edmonton, there are three 1,320-hp. engines and 10 by 12 single-stage centrifugal pumps. With one unit operating at the Edmonton and Kamloops stations, the line has a capacity of 75,000 bbl. daily. This can be increased to 120,000 bbl. daily by operating two units each at Edmonton, Edson, and Kamloops, and to 150,000 bbl. daily by operating two units at all four stations. The third unit as each station will serve as a standby.

Due to the high static head encountered at Edmonton, Black Pool, and Kamloops, pumping units are arranged in parallel at these stations. A series arrangement was chosen as more suitable at Edson and for the projected stations at Jasper and Gainford.

Hydraulic problem . . . Special hydraulic problems were encountered between Yellowhead and Kamloops, where elevation drops 2,600 ft. in 300 miles, and down the Coquihalla Pass, where it drops 3,600 ft. in 30 miles.

Pressure-control stations are located at Vavenby and Hope, B. C. Vavenby is 165 miles west and 2,100 ft. lower than Yellowhead pass. Here an automatic valve operates to insure that static head downstream to the Thompson River crossing at Kamloops (elevation, 1,120 ft.) is reduced by 650 ft. to a safe head of 2,160 ft.

At Hope (elevation, 210 ft.), 30 miles west of the 3,760-ft. summit of Coquihalla Pass, a battery of relief valves will spill oil into two 50,000-bbl. tanks to reduce pressure from Hope to Burnaby in case a main-line valve is closed accidentally.

Terminals and laterals . . . Major oil fields in the Edmonton area are connected to Trans Mountain by feeder systems of Imperial Pipe Line Co., Ltd., Edmonton Pipe Line Co., Ltd., Texaco Exploration Co., Canadian Gulf Pipe Line Co., and Interprovincial Pipe Line Co. Crude will be shipped from Leduc, Golden Spike, Woodbend, Joseph Lake, Armena, Camrose, Wizard Lake, Bonnie Glen, Duhamel, Malmo, Stettler, Fenn, Big Valley, Redwater, and Excelsior fields.

The Edmonton terminal has eight 150,000-bbl. and four 80,000-bbl. cone-roof tanks. The western terminal at Burnaby near Vancouver has six 150,000-bbl. and four 80,000-bbl. floating roof tanks. Crude will be shipped through the line in batches, and tank-farm facilities will permit handling of three and possibly four types. Those set for initial receipt are "Redwater," "Leduc," and "Light Mix," the latter coming from Joseph Lake, Armena, and Camrose fields.

The marine loading dock at Westridge on Burrard Inlet is fed by gravity flow from Burnaby terminal through 2½ miles of 24-in. line. Local lines have been built by Imperial and Shell to their refineries at Ioco and Shellburn, respectively; a 32-mile, 24 and 16-in. spur line is being built to General Petroleum Co.'s plant at Ferndale, Wash.

Communication . . . Installation of a microwave system on the big line was considered, but the idea was rejected because:

1. The tortuous route would require too many repeater towers, making the initial cost too high.

2. Maintaining continuous service would have been impractical because of the absence of roads and the heavy snowfall in two 80-mile stretches of the roughest country.

Facilities finally provided include:

. . . A leased telephone circuit approximately paralleling the pipe line and connecting about 25 locations, primarily for dispatching.

. . . A leased teletype service connecting about seven locations, intended principally for administrative messages.

. . . Company-owned dual-frequency radio system including 9 fixed and 25 mobile stations, designed mainly for contact with maintenance personnel but also for dispatching insurance.

Maintenance problem . . . All maintenance crews on the line are equipped with a variety of four-wheel drive vehicles including Willys Jeeps, Dodge Power-Wagons, and FWD trucks. Some of the crews will be equipped with tractors and backhoes, and during the winter with "snowmobiles," "snowcats," and "muskeg crawlers."

The heavy equipment will be carried over passable roads on heavy-duty trailers pulled by FWD trucks. Where this is impossible, it will be moved into otherwise inaccessible areas on three railway units, each consisting of a heavy-duty flat car and a combination sleeping-and-boarding car. These will be operated during emergencies with the cooperation of both railways.

Western Canada's main road systems do not cross the Rockies and the Cas-

cade Range via the Trans Mountain route. Improved roads are accessible for a total of only 370 miles along the route. About 165 miles of line can be reached from seasonably fair roads. In one 75-mile section roads are impassable in winter and in another 110-mile stretch there are practically no roads. Snow in the latter two sections averages 30 to 50 ft. annually.

The builders . . . Trans Mountain contracted with Canadian Bechtel, Ltd., to design and engineer the line and to act as agent for its construction.

Main-line contractors were Comstock Midwestern, Ltd., 417½ miles; Mannix, Ltd., 226 miles; Canadian Pipe Line Construction Co., Ltd., 19 miles; Anderson International Contractors, Ltd., 53 miles; and Missouri Valley Canadian, Ltd., 2½ miles (dock line). Comstock Midwestern laid the roughest stretches near Jasper and in the Coquihalla Canyon.

All told 96 firms furnished either equipment or services or both for the line.

Officers . . . Trans Mountain is headed by Robert L. Bridges, president. Chairman of the board is S. D. Bechtel, and H. H. Anderson is vice president and general manager.

Temporary headquarters offices are being maintained currently at 1070 Hornby Street in Vancouver. A new building now being built at 400 East Broadway in Vancouver is expected to be ready for occupancy about the middle of December.

A.I.O.C. Expands

Subsidiary buys interest in western Canadian firm

CALGARY, Alta. — Anglo Iranian Oil Co., Ltd., has moved into western Canada with the purchase by its subsidiary D'Arcy Exploration Co., Ltd., of a $5,000,000 interest in Triad Oil Co., Ltd., here.

The agreement calls for the sale of Triad to D'Arcy of 1,250,000 shares and $625,000 4½ per cent convertible notes. Another 500,000 shares and $250,000 notes will be bought by D'Arcy in two equal installments. These acquisitions are equivalent to about a 23 per cent holding in Triad. D'Arcy has the right later to subscribe to additional finance to bring its shareholding up to not less than 50 per cent.

Organization . . . All the present members of Triad's board will continue as directors, and two additional members will be nominated by D'Arcy. The Triad organization will be strengthened by the addition of three or four members of D'Arcy's technical staff but in all other respects, it is intended that Triad will continue under the same management.

The agreement marks the first active interest taken by Anglo-Iranian in exploration and development in the Western Hemisphere. The British-owned company has undertaken a major expansion of its activities in the Eastern Hemisphere since the loss of the Iranian properties in 1951. Triad has a production which last year averaged slightly more than 1,000 bbl. daily, mainly in Redwater field. Its acreage interests are spread over Alberta and Saskatchewan.

Fire Damages Refinery

BRANDON, Man. — Anglo-Canadian Oil, Ltd., shut down its 3,000-bbl. per day refinery here last week after a flash fire destroyed four main plant buildings and caused damage estimated at $200,000.

The main pumping unit, hot oil pumps, control building and the topping plant were destroyed. Two towers were also damaged as firemen battled the blaze for 3 hours before bringing it under control.

Polythene Plant Opening Due

EDMONTON, Alta. — Canada will get its first domestic supply of polythene when Canadian Industries, Ltd., places a $13,000,000 petrochemical plant in operation here this month.

Initially the new plant will turn out about 16.5 tons per day of polythene flakes through the use of 10,000,000 cu. ft. of gas from the Imperial Oil, Ltd., natural-gasoline plant at nearby Devon, Alta. This output is eight times larger than the polythene now available for import from the United Kingdom and the United States.

The plant's production will be shipped across Canada for use in the manufacture of a variety of finished plastic products, such as ice trays, vegetable wrapping paper, and electrical insulations. Polythene is reported to be the lightest of all commercial plastics, containing excellent electrical properties, and having a high resistance to chemicals and low temperatures.

The plant, which covers a 40-acre tract, will be operated through remote instrumentation and automatic control. The entire process will be regulated by a centrally located control room.

Portable Gas Plants Planned

EDMONTON, Alta.—The first portable gas-processing plants ever constructed in western Canada will be built within the next few months by Canadian Palmer Stendel Oil Corp. at the cost of about $1,000,000.

One of two planned plants will be in Acheson field near here and the other at Big Valley between Edmonton and Calgary.

Stockholders of Canadian Palmer Stendel will be asked to authorize changing the company name to Progas of Canada, Inc., at a meeting of shareholders in New York late this month.

Anchor Hiking L.P.G. Underground-Storage Capacity

Anchor Petroleum Co. soon will complete an expansion of its Hattiesburg, Miss., L.P.G. underground-storage project to handle 240,000 bbl. of propane and butane. Facilities include three large storage wells, truck-loading terminal, tank-car loading rack (shown above) capable of loading 20 cars, and modern dehydration and testing equipment. The company also is expanding storage capacity of its Midland, Tex., project to 480,000 bbl. and expects to begin drilling immediately at Bath, N. Y., on what is believed to be the first L.P.G. underground-storage project in the East. The Bath project will store 150,000 bbl. of products in a salt formation at 3,500 ft. through three wells, the first of which is expected to be completed early next year.

Progress Publicized

Activities throughout the nation highlight most grandiose Oil Progress Week in industry's public-relations history

THERE was little doubt anywhere late last week as the 1953 national Oil Progress Week drew to a close that this year's observation was the most tremendous ever staged.

Governmnt officials, thousands of oil men, and the public participated in hundreds of luncheons and dinners, speeches, radio and television shows, rallies, open houses, parades, oil exhibits, and other special events throughout the nation.

Government officials taking part in the celebration include Governors Murray of Oklahoma, Arn of Kansas, Kennon of Louisiana, Knight of California, Cherry of Arkansas, and Langlie of Washington; Secretary of the Interior Douglas McKay, Deputy Administrator of the Petroleum Administration for Defense Joseph LaFortune, and many others.

The theme of the sixth annual celebration, "Conservation," and the slogan, "Oil—at Your Service," were hammered home with billboards, posters, banners, pictures, booklets, leaflets, exhibits, and movies. A new oil motion picture, "American Frontier," which tells the story of the discovery of oil in the Williston basin in North Dakota in 1951, was distributed by the American Petroleum Institute to show what happens when oil is found in a new area in modern America. It showed thousands of citizens how planning and cooperation between the industry and local citizens aids both, eliminates the chaos of the old-time boom towns, and provides for orderly expansion of housing and education.

East . . . Presidents and other top executives of 50 oil companies were present at a luncheon meeting for community leaders at the Waldorf Astoria Hotel in New York October 13. B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., was the principal speaker. Theme for the luncheon was the oil industry's contribution to the city's progress and prosperity.

In Philadelphia, Frank M. Porter, president of the A.P.I., spoke at an oil-progress banquet at the Bellevue-Stratford Hotel for 1,000 oil men and guests, and Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Ind.), addressed 600 members of the Philadelphia Rotary Club.

Other meetings, parades, and various celebrations were held in Washington, New York, Philadelphia, Baltimore, Atlantic City, Charleston, Pittsburgh, Newark, Atlanta, Jacksonville, Tampa, Miami, and many other communities.

Midwest-Southwest . . . One of the most colorful spectacles of the week-long celebration was the so-called "Cavoilcade" Boat Parade in Port Arthur, Tex. Also in the Port Arthur-Beaumont area, the South Texas State fair featured a 35-ton rig which made hole nightly for thousands of fair goers.

Two of the most active communities in Texas were Pampa in the Panhandle and San Angelo in West Texas. Pampa opened with a parade and followed with a barbecue, beauty contest, speeches, movies, and banquet. San Angelo held a 3-day oil show, deluged the downtown area with displays, held daily radio and television shows, and watched a program put on by more than 3,500 Boy Scouts in the Concho Council.

Tours were arranged throughout the state for the public to see how all divisions of the industry operate.

In Lafayette, La., Interior Secretary McKay lauded industry conservation efforts before an audience of 500 attending dedication ceremonies for the Lafayette Oil Center, a $1,500,000 project comprising six buildings which will house oil-company offices.

Industry progress was dramatized in Oklahoma in a 50-car motorcade over the country's newest turnpike from Oklahoma City to Tulsa. Taking part in the motorcade were antique autos, modern vehicles, and several automobiles of the future.

In OPW kickoff ceremonies in Tulsa, Kansas' Governor Arn, chairman of the Interstate Oil Compact Commission, elaborated on the conservation theme for 600 persons attending an oil-progress forum sponsored by the Tulsa Chamber of Commerce. "Conservation is not negative," he said. "It does not imply failure or refusal to use. It does not mean hoarding. Conservation is efficient use without waste. A natural resource is not being conserved unless it is being used." Conservation, he said, has been and will continue to be the one common interest of the states, the industry, and the I.O.C.C.

West . . . In San Francisco, Ernest Thompson, member of the Texas Railroad Commission, was principal speaker during a salute to the industry staged by the California, San Francisco, and Oakland chambers of commerce.

Special events included parades, panel discussions on oil, high school speaking and essay contests, film showings, and tours of oil installations.

More than a score of top-level executives including several oil-company presidents addressed civic, community, and service club meetings throughout the region.

How oil benefits a community was shown by S. F. Bowlby, vice president of Shell Oil Co., in an address before an open dinner meeting in Ventura, Calif. "While the oil industry has prospered," he said, "the communities with which it has become inseparably wed have also prospered. Ventura is a good example."

"It is too brash to tie the entire growth of your community to the oil industry, but certainly the oil industry has a substantial part in that growth." Last year alone, he said, the industry paid in Ventura nearly $26,000,000 in wages and employed more than 5,000 workers. It also paid over $6,500,000 in county taxes—about 55 per cent of all taxes directly collected during the year, he said.

Industry Briefs

OKLAHOMA CITY.—Sun Oil Co. paid $27,279.50 for leases on 58 tracts totalling 7,627.09 acres in northwestern Cimarron County at a recent Oklahoma School Land Commission sale. The tracts leased are east of Kenton and northwest of Boise City extending to the Colorado line.

TULSA.—Sinclair Oil & Gas Co. completed moving to its new headquarters building at Tenth Street and Boston Avenue. Prior to the move, Sinclair's 730 employes were located at the company's own building at Fifth and Main streets, and three other office buildings here.

VENTURA, Calif. — Borg-Warner Corp.'s petroleum-mechanics research division has undertaken experimental tests with a sonic drill at a Shell Oil Co. lease in the Ventura Avenue field. The percussion drill will be powered by a sound generator developed by Bodine Soundrive Co., Los Angeles. Test drilling will be conducted on concrete pumped into an old well.

Department of Interior Building at Eighteenth and C Streets.

Research Bows to Economy

Hampered by low researcher salaries, Bureau of Mines carries on work to aid recovery and utilization of oil

Bertram F. Linz

ROCKETING costs of research, a lagging salary scale for young scientific personnel, and the administration's drive for economy have put a squeeze on the oil and gas research of the Bureau of Mines.

Probably the most important of the three is manpower. Industry competition for researchers has raised salary scales well above those of the Government and it is increasingly difficult to recruit scientists and technicians for public service.

Each new development in oil technology opens further the field of research and calls for increasingly complicated and expensive tools. Sometimes, as in the case of synthetic liquid fuels studies, complete pilot and demonstration plants are needed. And, the current effort of the administration to keep government expenses to a minimum so that burdensome taxes may be lightened puts an effective ceiling on appropriations for scientific studies not directly related to the national defense.

Despite these handicaps, the bureau is pressing forward with a research program to provide the information necessary for increased recoveries of oil and gas from known deposits and better utilization of petroleum products.

The Bureau of Mines was established in May 1910. Originally placed in the Interior Department, it was transferred to the Department of Commerce by President Coolidge in June 1925 and was returned to the Interior Department by President Roosevelt in April 1934.

In addition to its research work, the bureau makes statistical and economic studies to produce factual information on production, refining, transportation, inventories, and distribution of oil, issuing periodic reports valuable to industry, the public and the Government, including the military services. The results of its research are made available to the industry in reports on specific projects and problems, often conducted in cooperation with petroleum operators and organizations.

The major phases of the bureau's program are as follows:

. . . **Engineering research** to obtain data on production methods that will utilize more efficiently the formation or reservoir pressure in producing oil and gas and prevent the underground waste resulting from dissipation of energy.

. . . **Scientific and engineering research** on applying secondary recovery methods in the older fields and on improvements that can be made in the usual operations of air and gas injections and water flooding.

. . . **Engineering problems** of transporting crude oil and natural gas through pipe lines, the technical problems of storing crude oil and products in storage tanks, and the storage of oil products and natural gas in underground systems.

. . . **Chemistry and refining research** on the composition of thousands of different crude oils and on the chemical, physical, and combustion characteristics of the component parts of crude oils and petroleum products made from them. This is one of the most important of the bureau's activities because, there are always new problems that require more and more basic information. A part of this program also gives the military establishment reliable estimates of quantities and qualities of products available from domestic and foreign crudes.

. . . **Thermodynamics laboratory** studies of hydrocarbons and related substances found in petroleum and of chemical compounds that may be made from petroleum products. The studies determine optimum conditions for chemical reactions involving petroleum hydrocarbons and make possible the

designing of plants to use the minimum amount of steel and other critical materials, utilize manpower to best advantage and produce the maximum of the desired product at low cost.

... **Helium research** on the gas, as a tracer gas to delineate underground petroleum formations. The bureau is the world's only commercial producer of helium.

... **Research and development** of methods for the production of oil and gasoline from coal and oil shale.

A field office at San Francisco conducts research in petroleum to improve methods of developing and operating California fields and to advance methods of introducing energy from the surface to drive oil to wells in fields where the natural energy is depleted. Statistics on petroleum supply and demand on the West Coast also are issued from this office.

A research laboratory at Grand Forks, N. D., is working on problems arising from the development of the nation's estimated 355,725,000,000 tons of lignite, including petrographic research. A gasification pilot plant has produced more than 86,000,000 cubic feet of a water gas which could be used in making synthetic liquid fuels.

An experiment station at Bartlesville, Okla., operated in cooperation with the State of Oklahoma, is engaged in four highly important lines of investigation:

... **Primary production** studies of the behavior of natural reservoir systems and the transformation of energy during primary production processes, involving determination of the characteristics of the oil-producing formations and the oil, gas, and water they contain.

... **Secondary recovery** research on restoring energy to the reservoir system through such methods as injecting air, gas, or water into the underground formations.

... **Chemistry and refining** studies of the characteristics of crude oils and their products, and the relationships between properties, composition, utilization and availability of fuels for all types of internal-combustion engines.

... **Thermodynamic** studies of pure hydrocarbons and related substances necessary for improvement of refining, utilization and petrochemical processes.

In addition, the station is interested in the transportation of oil and natural gas.

A field office at Franklin, Pa., is directing its major efforts toward applications of secondary recovery to get a second crop from the oil fields of the Appalachian region, an important phase of which is a study of the technology of shooting wells with high explosives to increase the flow.

The Central Experiment Station at Pittsburgh is the principal center of research on synthetic fuels. Its facilities include a 200-acre tract at nearby Bruceton on which are situated the bureau's experimental coal mine and its synthetic liquid fuel laboratories.

The experiment station at Morgantown, W. Va., is working on the development of methods for producing synthesis gas from coal and also conducts petroleum studies in the Appalachian fields.

The station at Laramie, Wyo., is devoted to problems having particular significance to the Rocky Mountain oil and gas industry, some of the problems and difficulties under investigation being:

... **Reservoir research** to provide a better understanding of the oil, gas, and water relationships in oil reservoirs and the energy associated with these fluids so it can be used to obtain the greatest yield of oil.

... **Secondary recovery** studies to find out how the 50 to 80 per cent of oil originally present but unrecovered under present production methods can ultimately be produced.

... **Complete inventory** of the characteristics of the many crude oils and natural gases in the region.

... **Characteristics** of sulfur compounds found in petroleum to improve the refining of Wyoming "black oil" and other sulfur-bearing oils. Characteristics of the asphalts which may be obtained from the same oils.

... **Study of nitrogen** compounds in diesel fuels to determine their role in causing instability of these materials on standing.

The Laramie station includes what is believed to be the largest and best-equipped laboratory in the world for oil-shale research, with semipilot plant equipment for continuous or bath operation for retorting oil shale and determining its thermal characteristics and for fractionating, hydrogenating and cracking shale oil by different refining processes. The laboratory operates in conjunction with the demonstration plant for the production of oil from shale at Rifle, Colo.

Who's Who in the Interior Department

HEADQUARTERS

Office of the Secretary: Douglas McKay, Secretary, Room 6151; Felix E. Wormser, Assistant Secretary for Mineral Resources, Room 6654.

Bureau of Mines: John J. Forbes, Director, Room 4614; Arno C. Fieldner, Chief Fuels Technologist, Room 4425.

Fuels and Explosives Division: Louis C. McCabe, Chief, Room 4413; Harry Perry, Assistant Chief, Room 4413.

Petroleum and Natural Gas Branch: Roscoe A. Cattell, Chief, Room 4410; C. C. Anderson, Assistant Chief, Room 4416; H. J. Barton, Petroleum Economics Coordinator, Room 4310.

Synthetic Liquid Fuels Branch: H. H. Storch, Chief, Room 4428; John Tripp, Assistant Chief, Room 4428.

REGION 3

(California and Nevada)

H. C. Miller, Regional Director, Appraisers Building, 630 Sansome Street, San Francisco 11.

G. B. Shea, Chief, Fuels Technology Division and Petroleum and Natural Gas Branch, 1429 Appraisers Building, 630 Sansome Street, San Francisco 11.

REGION 4

(Wyoming, Utah, Colorado, Arizona, and New Mexico except for helium activities)

J. H. East, Jr., Regional Director, New Customhouse, Denver 2.

H. P. Rue, Chief, Fuels Technology Division, Petroleum and Oil Shale Experiment Station, 365 North 9th Street, Laramie, Wyo.

Boyd Guthrie, Chief, Oil-Shale Demonstration Branch, P. O. Box 792, Rifle, Colo.

REGION 5

(North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, and Michigan)

Paul T. Allsman, Director, 2908 Colfax Avenue, South, Minneapolis, Minn.

J. D. Lankford, Chief, Fuels Technology Division, 2908 Colfax Avenue, South, Minneapolis, Minn.

Robert McMurtrie, Chief, Lignite Branch, Charles R. Robertson Lignite Research Laboratory, Grand Forks, N. D.

REGION 6

(Kansas, Missouri, Oklahoma, Texas, Arkansas, Louisiana, and helium facilities in New Mexico)

C. W. Seibel, Director, 514 Barfield Building, Amarillo, Tex.

H. C. Fowler, Chief, Fuels Technology Division, Petroleum Experiment Station, P. O. Box 1321, Bartlesville, Okla.

Kenneth F. Anderson, Chief, Engineering Field Studies Branch, Room 1909, 1114 Commerce Street, Dallas.

Rollie F. Dobyns, Petroleum Engineer, 307 Federal Building, Wichita Falls, Tex.

REGION 8

(Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, Ohio, Indiana, Illinois, and Kentucky)

H. P. Greenwald, Director, 4800 Forbes Street, Pittsburgh 13, Pa.

Richard C. Corey, Chief, Fuels Technology Branch, 4800 Forbes Street, Pittsburgh 13, Pa.

Lester Hirst, Chief, Gas Synthesis Branch, Room 309, Mineral Industries Building, Morgantown, West Virginia.

R. B. Anderson, Acting Chief, Synthetic Fuels Research Branch, Bruceton, Pa.

Sam S. Taylor, Chief, Petroleum and Natural Gas Branch, 28 Davis Street, Bradford, Pa.

Crude Order Illegal?

Purchasers criticize Oklahoma action halting pipe-line proration, but whether it will go to court is question

Henry D. Ralph

AN order of the Oklahoma Corporation Commission purporting to end "pipe-line proration" is viewed by most crude-purchasing and pipe-line companies in the state as illegal and unworkable, but so far none appears inclined to challenge the order in the courts.

The order was issued in conjunction with the October allowables, and said "no pipe-line company purchasing or transporting less than the amount fixed by the order shall be allowed to purchase or transport oil in Oklahoma."

The effect of the order is to require every purchaser to take the maximum amount of oil set by the commission's allowable for every well or lease with which it has a connection.

The purpose apparently is to end the custom of pipe-line proration, whereby a purchasing company or pipe line often takes less oil for a period than the connected wells are permitted to produce under allowables. When this happens the pipe line applies the principle of ratable take, as required by the state's common-purchaser law, and applies the same percentage reduction to all wells, including those of the company itself or its affiliates.

Curtailed orders rescinded . . . Prior to the allowable hearing October 8, both Magnolia Petroleum Co. and Sunray Oil Corp. had announced intention to curtail their purchases of Oklahoma crude, stating that their market outlets could not absorb such large quantities. However, both companies have rescinded their announcements since the hearing.

The Corporation Commission fixed the October allowables at 485,000 bbl. per day, a reduction of 34,260 bbl. per day below the September allowables. Purchasers had nominated only 439,476 bbl. per day.

The pipe-line order is to be effective during October and November, but purchasers feel that if it stands unchallenged it could be extended or made permanent. They are greatly concerned about the effect, pointing out the following difficulties:

. . . It is probably illegal because it attempts to force a purchaser to buy a stipulated quantity whether or not he has a market or storage space for it. Failure to take the stipulated quantity for any reason whatever deprives the purchaser of the right to buy any oil in Oklahoma.

. . . A pipe line might be unable to move the full quantity of oil for reasons beyond its control, such as a break in the line, a shut-down of a refinery, or failure of its customers to accept delivery.

. . . Many wells and leases may not make their full allowables in some months for any of various reasons. This would not only put the entire pipe line out of business but the producer would be entirely without any market for his oil until he could induce some other pipe line to run a connection to his lease.

Thus one effect of the order is to force production at the absolute maximum of the allowables on penalty of not producing any at all. Since allowables often are greater than purchasers' nominations—and are considerably greater during October—the order forces more crude on the market than pipe lines can sell to refiners.

The Connally "Hot Oil" Act makes it a federal offense to violate any state proration order, so a pipe line could be in jeopardy of criminal action if it takes less than the allowable from any well just as it would be if it took more than the allowable. A complicating factor is that the commission has not yet issued its schedules of allowables for October, so the purchasers have no way of knowing whether they are in compliance with the order. As a matter of fact, the commission did not issue its September schedules until October.

Legal questions . . . The officials of one purchasing company have recommended to their top management that their company shut down all purchases in Oklahoma completely and immediately unless the order is repealed or clarified, but no action has yet been taken.

Other companies state that their attorneys are studying the order and that they are prepared to support anyone who will challenge its legality in a court action, but most of them appear to be waiting for someone else to take the first action. There is a question whether or not a purchaser or pipe line could bring court action to test the legality of the order without first being in violation of it and thus running the risk of losing the right to purchase any Oklahoma crude oil.

Production outstrips allowables . . . Magnolia's situation illustrates the problem of many crude buyers in Oklahoma. For the past several months the company has been nominating 26,000 bbl. per day, but the Corporation Commission has been setting allowables higher than nominations, and usually actual production has been higher than allowables. For example, in August Oklahoma's production was 40,000 bbl. per day above allowables.

By taking all crude offered at its connections, Magnolia has had to move in excess of 50,000 bbl. per day in recent weeks. By mid-September its storage was so full that if its runs had continued at the current rate Magnolia would have had only 40,000 bbl. of storage space by October 1, or less than 1 day's purchases. The company therefore announced that effective September 21 it would reduce purchases of Oklahoma crude by 25 per cent.

Following the Oklahoma commission's order Magnolia arranged for additional sales and storage space and announced that it would run all crude up to the allowables of its connected leases, but also announced that it would again nominate to purchase only 26,000 bbl. per day in November. The reduced allowables for October mean that Magnolia will reduce its runs of Oklahoma crude by only about 10 per cent instead of by the 25 per cent it previously announced.

Deepest Water Flood Begun

LINDSAY, Okla.—Cities Service Oil Co. will soon undertake the deepest water-flood project in the world on a 720-acre unitized block, the North Lindsay Bromide sandstone unit, in McClain County.

The water-supply well was spudded last week, and water was expected to be reached at 4,000 ft. Water lines and related equipment were being installed as the water well was drilled.

Cities Service plans to water flood the Bromide sandstone at 11,000 ft. The company estimates it will recover an additional 1,500,000 bbl. of oil by virtue of the project. Officials said the reservoir would produce less than 100,000 bbl. more without the water flood.

Cities Service expects to place most of the wells in the pool on pumps, but operators believe later in the water-flood stage, pressure may be increased to permit a flowing-type flood.

DOW CHEMICAL'S new Freeport, Tex., research center will house its organic and technical research groups in eight buildings. From the right are the library and offices; two organic labs; two chemical engineering labs; and the central lab and electrochemical engineering department.

New Center Dedicated

Dow Chemical's new laboratory facilities add to Texas Gulf section's growth as an important research center

FREEPORT, Tex. — Formal dedication of the new Dow Chemical Co. $2,600,000 research center here last week gave the Texas Gulf Coast area another push toward becoming a major research area for the oil industry and its related fields.

In addition to the newly dedicated Dow center, Shell Chemical Co.'s new enlarged research laboratory at Houston is now in operation and work is progressing on a new Houston laboratory for Humble Oil & Refining Co.

The new Dow center, known officially as the W. R. Veazey Research Center, will be used by the Organic and Technical Research groups of Dow's Texas Division. Veazey is a former chairman of the company's executive research committee and was a Dow director for 26 years. He is now retired.

The center is composed of eight buildings providing a total area of 64,400 sq. ft., including 25,500 sq. ft. of covered walk area.

The organic group will do research mainly in petrochemical products and processes, plastics and synthetic resins. The technical research group will work on new products and processes, construction materials, instrument development, electrochemistry, corrosion control and agriculture.

E. B. Barnes is director of the organic laboratory and C. M. Shigley is director of technical research.

Shell laboratory . . . Shell's new research lab at Houston is designed primarily for study of chemical manufacturing processes. The new facilities will serve the company's other manufacturing installations as well as the Deer Park plant at Houston. Chief function of the laboratory is to evaluate current manufacturing processes and work toward process and product improvement.

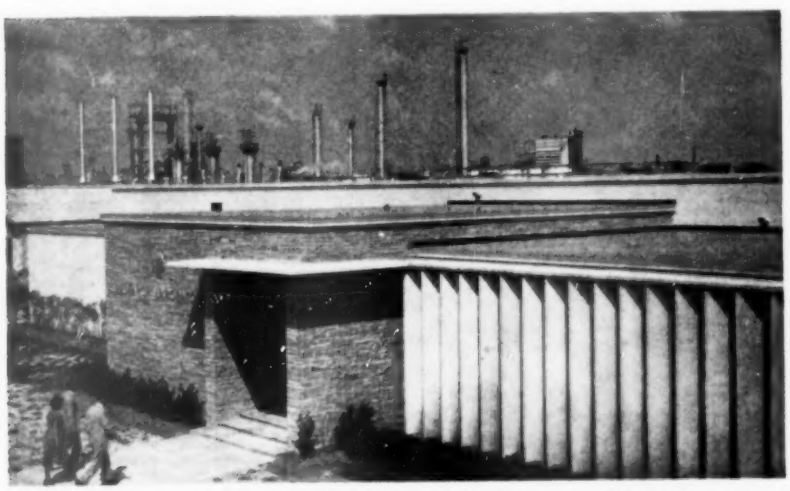
The new laboratory building contains 9,200 sq. ft. of working space, 1,200 sq. ft. for utility rooms and 1,600 sq. ft. of porch space. It is air-conditioned and louvers across the front of the structure are located so that no direct rays of the sun hit the interior.

B. M. Downey is manager of the new center, and Dr. John Anderson is director of research. Anderson, formerly with Shell Development Co. at Emeryville, Calif., has been in charge of the research laboratory since the division was organized in 1950.

Humble facilities . . . Research facilities for Humble are being constructed in Houston for the production and exploration departments and are expected to be completed and in use by January 1.

The new Humble building will contain two floors and a semibasement. A total of 330 employes in research and technical service work will occupy the building.

The new research center will provide space and modern facilities which will include a high-ceiling laboratory where engineers can set up heavy equipment and simulate field conditions.



SHELL CHEMICAL CO.'s new research laboratory in Houston is designed for study of chemical-manufacturing processes. Twenty-eight employes moved in and began work at the new laboratory last week. Towers behind are part of the Deer Park refinery.

South Texas Interest Sold

CORPUS CHRISTI, Tex.—Oil and gas properties in 11 fields in six South Texas counties have been sold to Moody-Texas Oil Corp. and Tex-Penn Oil & Gas Corp. for $5,000,000 by the Sullivan & Garnett interests.

The properties were sold by the John L. Sullivan Trust, the Georgia E. Sullivan Trust, and Sullivan & Garnett. The sellers will receive 60,000 shares of Pennsylvania Coal and Coke Corp. as partial payment and partial payment

in production from 3/32 of the net working interest.

Tex-Penn, a wholly owned subsidiary of the Pennsylvania coal firm, bought a 51 per cent interest and Moody-Texas a 49 per cent interest in the 12,000 acres on which there are 92 producing oil and gas wells.

WORLD'S DEEPEST COMMERCIAL PRODUCER is Shell Oil Co. 1 Gonsoulin-Minville in Weeks Island field, Louisiana. The well was recently completed 200 ft. lower than the former depth-record producer, through perforations from 17,260-17,306 ft. Shell formerly had the world's deepest producer at Weeks Island with 1 Weeks Gall Unit, producing gas-condensate in the lower Miocene at 17,039-17,122 ft. The new record breaker is an offset to the 1 Weeks Gall Unit.

New Deep Producer

Shell completes Weeks Island stepout at 17,260-17,306 ft. to break own record for world's deepest production

FRANKLIN, La.—Shell Oil Co. has completed the world's deepest producer at Weeks Island field in Iberia Parish on the Louisiana Gulf Coast.

Shell's 2 Gonsoulin - Minville was completed through perforations from 17,260-17,306 ft. for 141 bbl. of oil and 4,293,000 cu. ft. of gas daily through a 11/64-in. choke. Tubing pressure was 5,800 psi., and gas-oil ratio was 30,447:1.

The new deep producer erases the former mark, also in Weeks Island, held by Shell's 1 Weeks Gall Unit, which is producing gas-condensate from 17,039-17,122 ft. in the lower Miocene. The 2 Gonsoulin - Minville is on the north flank of the shallow piercement-type salt dome and is a northeast stepout from the 1 Weeks Gall Unit.

Total depth of the 2 Gonsoulin-Minville is 18,567 ft.—about 568 ft. deeper than originally planned and only 93 ft. short of the deep-drilling record for Louisiana held by Magnolia Petroleum Co. with its 1-D Ragley Lumber Co. in Allen Parish.

The well made more than 17,000 ft. of hole in 90 days—including a 1,000-ft. section which required 30 days. There were no major fishing jobs.

Production at Weeks Island is from steeply dipping flank sands extending around the north, northwest, west, south, and southeast sides of the salt dome. The field easily has more wells producing below 15,000 ft. than any other in the world. In addition to the new well, Shell has a dozen others below this depth. Humble also has several — among them the 1 Hortense Gonsoulin, the record holder before Shell completed its 1 Weeks Gall.

ALASKA

Alaskan Line Bids

Engineers anticipate early award of military contract

SEATTLE.—Bids to construct a multiple 600-mile, 8-in. military products system from Haines northward through British Columbia and Yukon, to Fairbanks, Alaska, were opened here last week by the Alaska District Corps of Engineers.

Bids were submitted for two completion dates, December 1954 and September 1955. The apparent low bid of $31,812,739.25 for the early completion date was submitted in a joint venture by four contractors, Anderson Bros. Corp., Brown & Root, Inc., Montin, and Benson construction companies. They proposed to carry the line around Kluane Lake in Yukon, instead of crossing it. Also, they submitted the same bid for the late completion date, but low bid for this project was $29,001,281.50 turned in by joint ventures Williams Brothers Co., McLaughlinn, Inc., and Marwell Construction Co. This latter bid also included carrying the line around Kluane Lake.

Another joint bid on the two completion dates was submitted but was considerable higher than the others. The fourth bid, submitted by Butler Construction and Engineering Co. was for $1,125,162 covering construction of the Haines wharf terminal.

Government estimate for the December 1954 completion was $29,615,732 for taking the line around the Kluane Lake, and $29,779,279 for crossing it. The 1955 completion date was estimated at $28,622,684 for going around the lake, $28,647,241 for pulling the line across it.

The Corps of Engineers is reviewing the bids and anticipates awarding of a contract at an early date.

ROCKY MOUNTAIN

Wildcat Agreements Signed

BILLINGS, Mont. — Three new agreements for exploration on Northern Pacific Railway Co. lands in Montana were announced last week by the company.

LeRoy H. Hines, Northern Pacific vice president in charge of oil development, said leases have been granted to Murphy Corp., in the Teepee area of Garfield County; to Seaboard Oil Co. in the North Indian Creek area of Rosebud County; and to Seaboard in the South Indian Creek area of Rosebud County.

FIRST C.N.G.A. AWARD was given to R. J. Hull, left, of California Research Corp. Presenting the award, which will be given annually to a member, under 42, for meritorious service to the California Natural Gasoline Association, is L. V. Cassady, Lomita Gasoline Co. and award committee chairman.

Import Cut Proposed

C.N.G.A. speaker suggests reducing California imports, reshuffling domestic crude to curb mounting inventories

D. H. Stormont

LOS ANGELES.—Reduced imports of foreign crude and redistribution of local crude supplies have been proposed as a means of curbing rapidly growing West Coast inventories.

The suggestion was made by Stark Fox, executive vice president of Oil Producers Agency of California, in an address before the California Natural Gasoline Association.

The supply surplus, which has existed since the first of the year, has resulted in total petroleum stocks gaining about 20,000,000 bbl. Continuation of the trend will raise them to around 130,000,000 bbl. by the end of the year . . . a level which in 1949 resulted in crude-oil price cuts.

"I cannot say whether total stocks will become burdensome at 130,000,000 bbl. or at some other level. I think I can say, however, that there is now no scarcity of any kind, and that the difference between 'no scarcity' and 'unmanageable surplus' is a very fine line."

Foreign crude imports, he said, are playing a significant part in the stock build up.

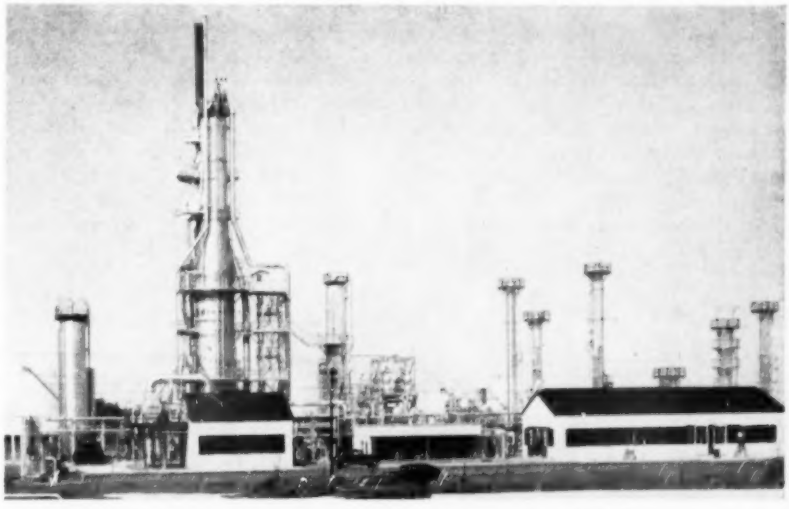
Receipts from domestic sources outside of District 5 also have affected the stock build up. Product pipe lines from Salt Lake City and Billings into Washington will increase the rate of deliveries. In addition the Trans Mountain line from Alberta to Vancouver will begin delivery of oil this month at a rate of 25,000 bbl. daily.

"These crude and product lines and new refinery capacity represent a distinct encroachment on the market for California production, just as much as imports of foreign oil by tanker. They are different in one respect, however. They are less flexible. They will tend to be operated at or near capacity, while tanker shipments of foreign crude can, within limits, be varied to meet demand conditions."

Imports flexible . . . "Since foreign imports are a significant portion of total supply, and since they can be varied, it would seem that it is within the power of the industry, and particularly those in the industry who are importers, to prevent so great a supply as to topple the industry on the Pacific Coast. That can be done by reducing imports when supply is excessive. It would seem to be worth the effort. . . .

"If, in reducing imports, it would be necessary for some units in the industry to augment their present supply from local sources, which would probably involve some redistribution of crude among purchasers, that would seem to be worth the effort, too.

"There is no question that at present and for the immediate future, there is an industry-wide surplus. When that condition has arisen in the past, it has inevitably had unfavorable economic repercussions."



Mid-Continent's Newest Cat on Stream at Cushing

The Mid-Continent's newest cat cracker is this 5,000-bbl. fluid unit at Midland Cooperative Wholesale's Cushing, Okla., refinery. The cracker was dedicated October 2. The construction program at the plant also involved revamping of crude and cat polymerization facilities. Crude capacity was increased 70 per cent to 10,500 bbl. daily, poly capacity 700 per cent to 400 bbl. daily. Feed for the new cracker will be supplied via a converted thermal unit previously rated at 1,800 bbl. per day. Contract for the major portion of the work was held by Refinery Engineering Co., Tulsa.

Settlements Pushed

Brownell says increase of consent decrees in antitrust cases doesn't mean his department relaxing enforcement

WASHINGTON.—More consent decrees in antitrust suits against the oil and other industries were in sight this week as Atty. Gen. Herbert Brownell, Jr., announced this method of settling cases will be pressed in a drive to clear court dockets of long-standing complaints.

Brownell emphasized, however, that the change in administration and appointment of a citizen's committee to study the enforcement of antitrust laws do not signalize any reversal of long-standing Justice Department antitrust policies. There will be no relaxation of enforcement as anticipated in some quarters when the Republican returned to power last January.

The attorney general explained it takes approximately 2½ years after a case is filed to bring it to trial. Any case pending longer is considered an old case. There were 143 antitrust suits on file in the courts last July 1, of which 54 were in the "old" category. In the past 3 months, nine of these and eight other suits have been disposed of, largely by consent decrees. In the same period the department filed 16 new criminal and 8 civil antitrust suits.

Consent decrees, by which all parties agree on a judgment without going to trial, are being sought just to enable the department to "drive faster," Brownell said.

"I think consent decrees should be used whenever an honest decree can be obtained," he said. "By an honest decree I mean a decree which does not impose unnecessary requirements on defendants on the one hand and does not lower the standards of relief maintained by government on the other hand."

Unfortunately, he added, while defendants frequently are willing to enter into consent decrees, settlements often are reached only after a trial date has been set and department staff and company lawyers have gone to the trouble and expense of preparing for trial. A quicker decision to reach an out-of-court settlement, he pointed out, would save time and money for both sides.

Study made . . . Members of the department's study committee met with officials here last week to finalize the agenda for the investigation into various problems of antitrust law administration and enforcement. The study is to cover such subjects as distribution, patents and trade-marks, foreign commerce, administration and enforcement, and legal and economic concepts of competition and monopoly.

"The appointment of this committee in no way signals a halt to a vigorous antitrust enforcement," Brownell declared. "The chance that the study group may recommend some changes in antitrust law administration does not mean that enforcement of existing antitrust policies will be relaxed."

Maintenance of a vigorous policy of enforcement was evidenced by the disclosure that the department is considering a request to Congress for authority to subpoena business records before a case goes to trial. This would strengthen the Government's position in negotiating consent decrees. Under present law the department can subpoena records before trial only if a court orders the defendants to produce the documents.

The other recommendations designed to strengthen enforcement will be submitted to Congress next year, Brownell said. They would:

. . . Increase from $5,000 to $50,000 the maximum fine that the courts may impose on defendants convicted of criminal violation of the antitrust laws.

. . . Make triple-damage awards in suits between private parties discretionary with the courts. Under present laws, triple-damage awards are mandatory and the department feels that this sometimes encourages juries to bring in not guilty verdicts when they feel that a defendant may be guilty but should not be required to pay heavy damages.

Dwyer Heads FOA Division

WASHINGTON.—Cornelius Dwyer, chief of the petroleum branch of the Mutual Security Agency, has been appointed director of the industrial specialist division of Foreign Operations Administration, successor to MSA.

The industrial specialist division will include petroleum, coal, metals and certain other commodities as well as FOA activities in Latin America, the Middle East and other areas over which the agency has been assigned foreign aid jurisdiction.

John Tannhauser will serve as acting chief of the petroleum section of the new division.

Alaskan Oil Scene

Government lands sought for private development

WASHINGTON.—A plea that the Government relinquish its oil-bearing lands in Alaska and join with territorial officials in a broad program of exploration and development of the area's oil resources by private industry was laid before Interior Department officials last week by Gov. B. Frank Heintzleman.

In Washington for a series of conferences with officials, Heintzleman urged that the Navy release Petroleum Reserve No. 4, a 37,000 square-mile tract on which it expended millions of dollars in an 8-year unsuccessful search for commercial oil.

If the land was given up, the governor said, he would work with the Alaska Development Board to encourage exploration and development by private capital.

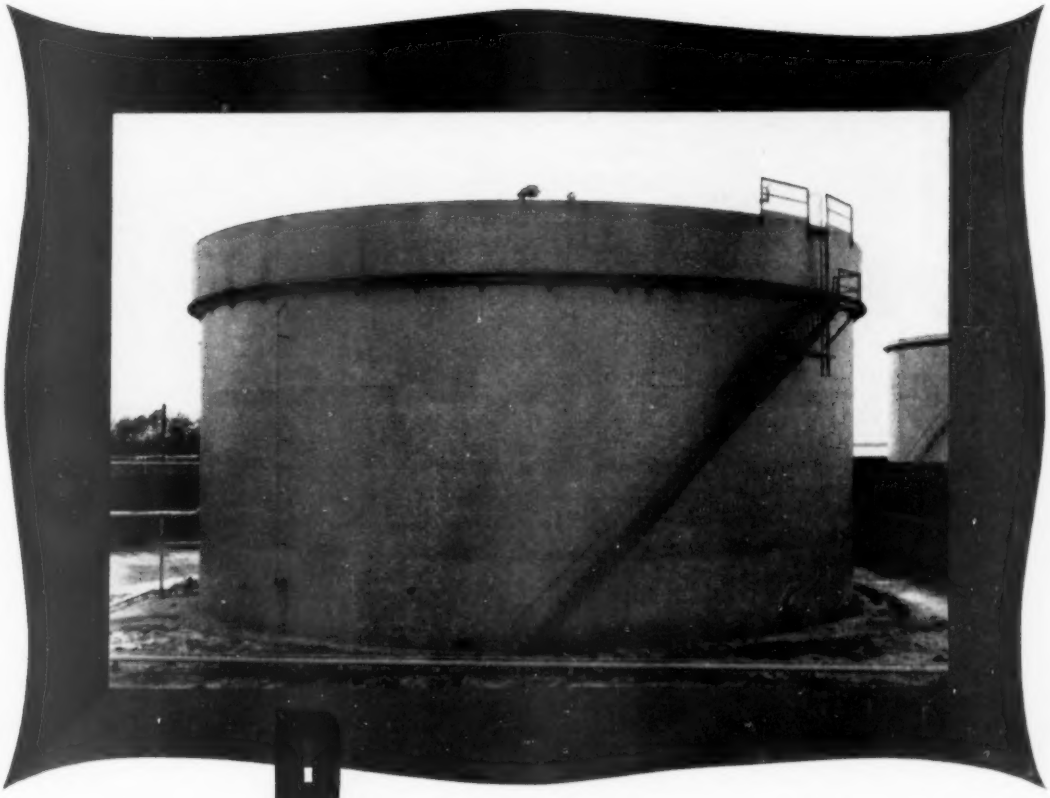
Heintzleman also is seeking to have the Geological Survey and Bureau of Mines increase their exploratory work, particularly in the area served by the Alaska Railroad and near Nome.

Although the Navy pulled out of Alaska last March after dropping approximately $45,000,000 in exploration and drilling, Capt. R. H. Meade, director of Naval Petroleum Reserves, expressed the view there still was a "reasonable possibility" that commercial deposits may be discovered some day.

Present exploration . . . While the vast naval reserve blocked private exploration in that part of Alaska, considerable interest has been evidenced in the oil possibilities of other parts of the territory.

The Interior Department last February approved a 10-year exploratory program looking toward the development by the Phillips Petroleum Co. of nearly 1,000,000 acres in the Katalla-Yakataga area, adjacent to the Gulf of Alaska. Except for the Navy's work, this was the first oil and gas exploration to be undertaken since the entry of the United States into World War II in 1941.

In August, the department announced the discovery of new oil seepages in the



Picture of a Horton Lifter Roof

. . . busy reducing evaporation loss at a Southern terminal

This Horton Liquid Seal Lifter Roof, located at the Shell Oil Company terminal in Memphis, Tennessee, is designed to prevent evaporation loss of volatile hydrocarbons by providing an expansible vapor space which will compensate for expansion and contraction of the air-vapor mixture above the liquid.

When the air-vapor mixture expands in a lifter roof tank, or in the interconnected tanks, the lifter roof moves upward to provide space for the additional vapor volume thus formed. When conditions reverse, the roof returns. No breathing loss takes place as long as the expansion of the air-vapor does not exceed the capacity of the lifter roof.

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Birmingham, 1	1536 North 50th St.	Havana	402 Abreu Bldg.	Pittsburgh, 19	3228 Alcoa Bldg.
Boston, 10	1025-201 Devonshire St.	Houston, 2	2119 C & I Life Bldg.	San Francisco, 4	1554—200 Bush St.
Chicago, 4	2128 McCormick Bldg.	Los Angeles, 17	1523 General Petroleum Bldg.	Seattle, 1	1325 Henry Bldg.
Cleveland, 15	2204 Midland Bldg.	New York, 6	3347—165 Broadway Bldg.	Tulsa, 3	1606 Hunt Bldg.

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Comprimo, N.V., 21, Amstel, Amsterdam (C), Netherlands
Compagnia Tecnica Industria Petroli, Rome, Italy
Whessoe Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Sociedade Chibridge de Construcoes Ltda., Av. General Justo, 275, Grupo 306, Rio de Janeiro, Brazil

Malaspina Glacier area 45 miles northeast of the nearest previously known seepages of the Katalla-Yakataga area.

In the same month the State Department revealed the satisfactory conclusion of a year's negotiations with Canada for the right to lay a military 8-in. products pipe line from Haines, Alaska, through Canadian territory to Fairbanks. Although there is no civilian need for such facilities at the present time, the Corps of Engineers, looking to future possible development, said the line would be available for civilian use when not needed for military purposes.

U.S. to Sell Plants

Bureau of Mines synthetic fuels plants go on block

WASHINGTON.—Bids for the sale or lease of the government's synthetic liquid fuels and anhydrous ammonia plants at the Louisiana, Mo., Ordnance Works will be opened by the district office of the Corps of Engineers in Omaha, Neb., November 16.

The two synthetic liquid fuels installations, formerly operated by the Bureau of Mines as demonstration plants in its program for development of gasoline production from coal, cost the government approximately $15,000,000. The ammonia plant, operated during the war, cost about $16,000,000.

Disposition of these facilities was ordered by Congress this year after Interior Secretary Douglas McKay directed that the synthetic fuels plants be shut down. They have been put into semipermanent standby status, but are in shape for quick return to use.

One of the fuels plants was built to demonstrate the production of oil, gasoline and chemicals from coal by the hydrogenation process. The other operated on the gas synthesis process.

The government plans to dispose of the plants by sale, if possible, but if this cannot be done they may be leased. The plants may be purchased or leased as a group or singly, but if only the ammonia plant is disposed of the synthetic liquid fuels plants will be maintained in standby status for future disposition.

U. S. Lease Sale Scheduled

WASHINGTON.—Oil and gas leases on 1,280 acres of land in Montana and New Mexico will be sold to the qualified bidders of the highest bonuses by the Bureau of Land Management this month.

The bureau will open bids October 21 for a lease of 40 acres in the known geologic structure of the Whitlas field

WATCHING WASHINGTON

Bertram F. Linz

Court to Feel Warren Touch

Earl Warren of California who recently took the oath of office as the chief justice of the U. S. Supreme Court may exert an important influence on the thinking of the high tribunal in cases involving the oil and gas industry, but not on the tidelands issue.

Warren is expected to disqualify himself when the cases attacking the constitutionality of the Submerged Lands Act come before the court. The tidelands controversy began with a suit against California and Warren, as governor, took an active part in his state's moves to defend its title to the offshore lands.

Warren is expected to take part in consideration of several other cases involving oil and gas. Among them will be the appeal of Phillips Petroleum Co. for a review of the federal court decision which upset a Federal Power Commission finding that Phillips is not a natural-gas company subject to FPC jurisdiction.

The new chief justice is the fourteenth man to hold the post and is the first appointment to the court by a Republican president in 21 years. Seven of the other eight justices on the bench are Democrats.

Defense Needs Revised

The Defense Department is preparing new estimates of military requirements for war in the light of recent disclosures that Russia has solved the problem of the hydrogen bomb. The new estimates are to be used as the basis for a revised mobilization program of such magnitude and effectiveness to deter an aggressor if we should be attacked, and enable us to fight and win.

The need for such a program was outlined by Defense Mobilizer Arthur S. Flemming in a report to President Eisenhower in which he pointed out that in war resources, not dollars, are the limiting factor.

Refining capacity is expected to reach 8,100,000 bbl. daily by the end of this year, compared with 6,700,000 bbl. daily at the beginning of 1950. Production of high octane aviation gasoline, the principal supply bottleneck among petroleum products heretofore, is now more nearly in balance with requirements and new projects for the production of alkylates are being pressed, Flemming reported.

Earlier private orders for tankers have been canceled in recent months with the result that the interim goal for oil carriers is further from fulfillment than it was 6 months ago. He said a program for encouraging construction of vessels which would be badly needed in war has had to be developed.

Flemming did not say specifically that further substantial increase of the oil industry was immediately necessary, but additional expansion was seen implicit in his explanation that the major objectives now are to show what resources we have and how we should divide them to meet war needs.

Super-inch Line Up to U. S.

It's up to the National Security Council now to decide whether the Government is to go ahead with its idea of a super-inch defense pipe line from the Gulf to the East Coast.

Views expressed by industry members at the meeting of the National Petroleum Council September 29 have been forwarded by the Petroleum Administration for Defense to the Office of Defense Mobilization, which in turn is expected to report to the NSC.

There was definitely no enthusiasm for the plan at the NPC meeting. The objections offered were largely economic—based on the probability that the pipe line would cut deeply into tanker operations and might materially affect the industry's price structure. The discussion also disclosed a major difference of opinion between some oil men and the ability as to whether enemy attack in the next war would be confined to the cutting of sea transportation lines or be directed to the sources of oil products supply, destruction of which would be much more effective.

In view of the opposition expressed by the industry thus far, it is likely that government officials will have to explore the possibilities of government construction, either in its entirety or in cooperation with the industry, of a line that would be kept in standby until needed.

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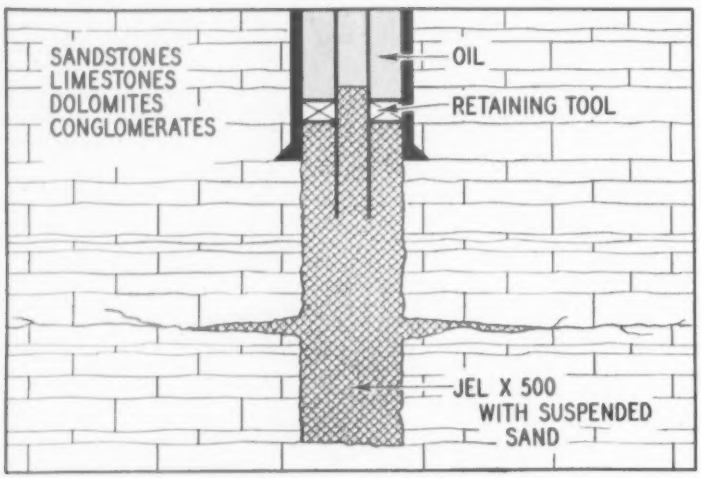
PRODUCTION INCREASED 26 BOPD WITH DOWELL STRATAFRAC

New Dowell Service Combines Advantages of Acidizing and Fracturing in Single Treatment



This well's initial production was 19 BOPD. While the well had not declined, it was not considered good for its location. After various other remedial methods had failed, a Dowell Stratafrac treatment increased oil production to 45 BOPD. Payout time was estimated at 36 days.

Stratafrac treatments using Jel X 500 have increased production from all types of oil bearing formations—limestone, dolomite, sandstone, chat and conglomerate. This service is designed to fracture and acidize the formation in a single operation.

Stratafrac treatments carry suspended sand into existing fractures as an abrading and propping agent. They are also designed to remove paraffin or other heavy hydrocarbons present in the fractures or formation.

Stratafrac treatments are engineered to save you money by holding rig time to a minimum. All materials arrive at the well ready-mixed. No jel-breaker solution is needed following Stratafrac treatments, as the material returns to the well bore as a thin, free-flowing liquid. The well can be returned to production immediately without costly shut-in time.

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in Liberty County, Montana, and on October 28 will open bids on three parcels aggregating 1,240 acres in the known geologic structure of the North Shugart field, 35 miles from Artesia, N. Mex.

Secondary Stocks Up

Largest increase in August shows in distillate boost

WASHINGTON.—Secondary inventories of major oil products increased by 3,500,000 bbl. during August — approximately 1,000,000 bbl. more than in the same month last year—but at the close of the month were still 3,000,000 bbl. less than on the same 1952 date.

Total stocks in the hands of jobbers and in bulk terminals of refiner-marketers increased from 49,831,000 bbl. July 31 to 53,300,000 bbl. August 31, as compared with an increase from 53,985,000 to 56,493,000 bbl. in the same period last year, the Census Bureau announced last week.

Approximately 49,740,000 bbl. of the stocks held on August 31 were in PAD districts 1, 2, 3, and 4, where storage capacity was estimated by the bureau at 85,500,000 bbl.

SECONDARY STOCKS

(Thousands of barrels

	Aug. 31, 1953	July 31, 1953	Aug. 31, 1952
District 1:			
Gasoline	5,301	5,397	5,756
Kerosine	3,140	2,818	3,420
Distillate	11,145	9,044	11,747
Residual	4,609	4,767	4,754
Total	24,195	22,026	25,677
District 2:			
Gasoline	8,303	8,529	8,176
Kerosine	3,070	2,816	3,547
Distillate	5,693	4,877	6,488
Residual	1,527	1,315	1,754
Total	18,593	17,537	19,965
District 3:			
Gasoline	2,893	2,969	3,018
Kerosine	723	705	698
Distillate	1,069	901	1,077
Residual	706	636	886
Total	5,391	5,211	5,679
District 4:			
Gasoline	987	1,034	1,023
Kerosine	87	90	91
Distillate	482	490	469
Residual	6	5	7
Total	1,562	1,619	1,590
District 5:			
Gasoline	2,092	2,093	2,141
Kerosine	100	103	107
Distillate	1,281	1,165	1,221
Residual	86	77	113
Total	3,559	3,438	3,582
Total U. S.:			
Gasoline	19,576	20,022	20,114
Kerosine	7,120	6,532	7,863
Distillate	19,670	16,477	21,002
Residual	6,934	6,800	7,514
Total	53,300	49,831	56,493

Caltex New York Headquarters Has New Home

This new 25-story building will provide offices for the New York headquarters of California Texas Oil Co., Ltd. The building was erected by Uris Brothers at 380 Madison Avenue, between 46th and 47th streets, on the site of the old Ritz-Carlton Hotel. New York personnel of the firm is now scattered in four buildings.

The most significant changes in stocks noted by the bureau were an increase from 16,477,000 to 19,670,000 bbl. in distillates, the largest increase reported for any month this year, and a reduction of gasoline from 20,022,000 to 19,576,000 bbl., the first sizable drop since last May. At the close of August 1952, inventories of distillates were 21,002,000 bbl. and gasoline 20,114,000 bbl.

Stocks of kerosine increased during the period from 6,532,000 to 7,120,000 bbl. to compare with 7,863,000 bbl. last year and residual fuels increased from 6,800,000 to 6,934,000 bbl. to compare with 7,514,000 bbl.

Inventories held in the several districts on August 31, compared with July 31 and August 31, 1952, are shown in accompanying table.

Study of Energy Supply Set

WASHINGTON.—The problem of assuring a continuing supply of low-cost energy adequate for the needs of both economic development and national security will be the subject of special consideration at the mid-century conference on resources for the future to be held here December 2-4.

A steering committee to develop a program on energy resources was appointed last week by Resources for the Future, Inc.

Farrington Daniels, president of the American Chemical Society and head of the department of chemistry at the University of Wisconsin, Madison, was named chairman of the committee. Membership of the committee includes Austin Cadle, manager of the economics department of Standard Oil Co. (Cal.) San Francisco; L. F. McCollum, president of Continental Oil Co., Houston; J. French Robinson, president of the Consolidated Natural Gas Co. of New York, Shaker Heights, Ohio; H. C. Hottel, professor of fuel engineering at Massachusetts Institute of Technology, Winchester; and Bertrand A. Landry, chief of the division of fuels and combustion at the Battelle Memorial Institute, Columbus.

Tidelands Battle

Coastal states get support for approaching legal fight

WASHINGTON.—Alabama's attack on the constitutionality of the Tidelands Act will be vigorously opposed by the National Association of States Attorneys General and by a number of individual states, as well as by the Department of Justice.

The case was reviewed last week at a meeting between members of the executive committee and the submerged lands committee of the Attorneys General's Association and Attorney General Herbert Brownell, Jr., and members of his staff.

The department has not yet filed its response to Alabama's petition. A spokesman for the state officials advised Brownell that the association plans to file a brief in support of the

constitutionality of the legislation and that a number of states also would file briefs through their respective attorneys general.

The suit to invalidate the return to the coastal states of the submerged lands within their historic borders was filed in the Supreme Court by Alabama in an effort to get a final decision more quickly than it could be secured through a suit previously filed in the federal District Court here by Arkansas.

The first decision to be reached by the high court will be on the question of accepting the case. If it does agree to hear it, considerable time will be required for the filing of arguments by the state and federal Government, as well as by any states or organizations that may be permitted to participate, so that it is unlikely that final argument could be heard before next spring.

Line Application Due

FPC Authority to be asked for Gulf-to-Michigan line

WASHINGTON.—American Louisiana Pipe Line Co. is preparing to file an application with Federal Power Commission for authority to build a 30-in. pipe line from Louisiana Gulf Coast gas fields to serve markets principally in Michigan and Wisconsin.

Announcement of the new line was made recently by American Natural Gas Co., of which American Louisiana is a subsidiary. The Securities and Exchange Commission approved purchase by the parent company of up to $500,000 in common stock of the subsidiary to finance the cost of obtaining regulatory approval.

The pipe line, scheduled for completion by June 1, 1956, will have an initial capacity of 300,000 M.c.f. of gas a day which may be expanded to 550,000 M.c.f. daily to meet increased demands. Cost is placed at $120,000,000.

In anticipation of increased gas supplies, Michigan Consolidated Gas Co. is now developing what was once Michigan's largest gas field into an underground storage reservoir to hold approximately 60,000,000 M.c.f. of gas. The new field will give the American Natural system total storage capacity for more than 110,000,000 M.c.f. of gas.

American Natural also has pending before the FPC a reconsideration of an order denying the application of Panhandle Eastern Pipe Line Co. to reduce its deliveries to American at Detroit from 125,000,000 to 87,500,000 cu. ft. daily.

SOUTHWEST

Tax Settlement Seen

Supreme Court to pass on Texas' gas-gathering tax

WASHINGTON. — Constitutionality of Texas' highly controversial natural gas gathering tax will be decided within the next few months.

The Supreme Court last week accepted a petition of Panhandle Eastern Pipeline Co. and Michigan-Wisconsin Pipe Line Co. for a ruling on the tax, which was held valid last June by the state Supreme Court.

The two companies contesting the levy are, in effect, representing a large number of pipe-line companies which have filed a total of 117 suits, now involving some $27,000,000 paid under protest.

Basis of the attack on the tax is the contention that it is an unconstitutional burden on the free flow of trade between the states.

"The burden of the tax ultimately will be borne by those persons in other states who consume the gas," the court was told in the petition filed by Michigan-Wisconsin. "Thus the tax statute enables the State of Texas to achieve the politically popular result of raising revenue at the ultimate expense of citizens of other states."

Panhandle charged the tax is a bold attempt "to make the people of other states bear the burdens of a state's local government."

"Every gas pipe-line company which operates lines leaving Texas is subject to the tax simply because it takes possession of the product within Texas for the purpose of transportation," the company asserted.

The transportation tax of 9/20 of a cent for each 1,000 cu. ft. of gas taken for transmission went into effect September 1, 1951, and was immediately contested by the pipe-line companies.

The attack on the levy was based not only on its alleged unconstitutionality but also on the contention it was in violation of existing contracts between the companies and the producers from whom they purchase gas.

San Juan Buys Mazda

DALLAS.—San Juan Oil Co., Dallas, last week acquired virtually all of the stock of Mazda Oil Corp. from National Phoenix Industries, Inc., according to an announcement by Robert J. Bradley, president of San Juan.

San Juan has been managing the Mazda properties for the past year and a half for the account of National Phoenix and will continue to operate Mazda as a wholly owned subsidiary of San Juan Oil Co.

The transaction, involving in excess of $2,000,000, includes 106 producing wells in Kansas, Oklahoma, and Texas with a daily net production of approximately 800 bbl. of oil. The deal also involved approximately 24,000 net acres of wildcat acreage in Oklahoma.

Commission Issues Warning

AUSTIN.—The Texas Railroad Commission has issued a warning reminder to operators and purchasers that a gas-well potential test must be made within 10 days after a well has been reclassified from oil to gas, and that allowables will not be effective more than 10 days before the test.

The memorandum pointed out that some operators have gone long periods without filing one of these tests, or without seeking exemption to Statewide Rules 24 and 25. In most cases, the wells had been reclassified because the gas-oil ratio was in excess of 100,000 cu. ft. of gas per barrel of oil. As a result, these wells were shut down to make up for over production.

Also, the order warned against taking gas from a gas well 10 days prior to the time the test begins.

Texas Water Flood Asked

AUSTIN.—Argo Oil Corp. has asked the Texas Railroad Commission for permission to water flood the Pettus sand underlying its 373-acre H. C. Edrington Estate "I" lease in South Campana field, McMullen County.

Fifteen of the 33 producing wells in the Pettus reservoir are on the lease involved. A dry hole on the lease is to be used as a salt-water injection well. Argo estimated additional recovery as a result of the project at 925,000 bbl.

Repressure Permit Sought

AUSTIN.—The Texas Railroad Commission has been asked for permission to repressure with gas the 1,100-ft. sand underlying four leases in Cooke County Regular field, Cooke County.

Milton O'Neal, spokesman for the lease owners, said plans are to convert seven of the 26 producing wells involved to gas injection wells. He estimated that 200 acres involved in the area are productive.

The leases are owned by J. M., O. W., W. F., and W. O. Russell and Charles Hellman.

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A.P.I. Program Set

Wide variety of technical subjects again scheduled for world's biggest convention of the petroleum industry

CHICAGO.—Leaders in government, finance, and industry will address the thousands of oil men who will converge here November 9 for the thirty-third annual meeting of the American Petroleum Institute.

Sessions of the world's biggest get-together of oil men will be held in the Conrad Hilton Hotel and the Palmer House during the 4-day meeting.

As in years past, there will be general sessions, group sessions, meetings of the various A.P.I. divisions, and scores of meetings of committees working independently on the varied problems of the petroleum industry.

Speakers from outside the operating oil industry will include Secretary of the Interior Douglas McKay, Oklahoma Gov. Johnston Murray, Mutual Life Insurance Co. Chairman Lewis W. Douglas, Chase National Bank Chairman John J. McCloy, and W. L. Davidson, director of the Office of Industrial Development of the U. S. Atomic Energy Commission.

Tentative program for the huge 4-day meeting was released last week by the A.P.I. Here are the papers to be presented at the technical and general sessions:

MONDAY, NOVEMBER 9

Group Session—Fundamental Research

9:30 a.m.—"The Fundamentals of Hydrocarbon Behavior," J. E. Sherborne, Union Oil Co., Brea, Calif.; "Mechanism of the Displacement of Oil from Porous Materials," Morris Muskat, Gulf Oil Corp., Pittsburgh; "Study of Near-Shore Recent Sediments and Their Environment in the Northern Gulf of Mexico," C. L. Moody, Ohio Oil Co., Shreveport.

Public Relations

11 a.m.—"The Myth of Monopoly," H. S. M. Burns, Shell Oil Co., New York; Presentation of OIIC "Certificate of Appreciation," Stanton K. Smith; Great Lakes District OIIC film, "It's Your Move."

Division of Refining

1:30 p.m.—"Fluid Coking of Residua," A. Voorhies, Jr., Esso Standard Oil Co., Baton Rouge, La., and H. Z. Martin, Standard Oil Development Co., Linden, N. J.; "Lummus Continuous Contact Coking Process," Valentine Mekler, A. H. Schutte, and T. T. Whipple, Lummus Co., New York.

Division of Marketing

2 p.m.—"Marketing Position or Profits, or Both," A. W. Peake, Standard Oil Co. (Ind.), Chicago; "Some Marketing Problems at the Retail Level," H. A. Inness Brown, publisher The Gasoline Retailer, New York.

Division of Transportation

2:30 p.m.—Address, Robert B. Murray, Jr., Under Secretary of Commerce for Transportation, Washington, D. C.; Address, A. A. Stambaugh, Standard Oil Co. (Ohio), Cleveland; Address, W. L. Davidson, Director, Office of Industrial Development, Atomic Energy Commission, Washington.

TUESDAY, NOVEMBER 10

Group Session—Financial and Accounting

10 a.m.—Address, Donald P. Jones, Sun Oil Co., Philadelphia; Address, Richard Heflebower, Economist, Northwestern University, Evanston, Ill.

Division of Transportation

10:45 a.m. — Pipe-Line Symposium: "Propane Transportation and Storage on a Products Pipe-Line System," J. W. Boyd, Phillips Pipe Line Co., Bartlesville, Okla.; "Solution of Pipe-Line Problem Using an Electronic Calculator," E. A. Slade, Service Pipe Line Co., Tulsa; "New Techniques and Current Problems in Controlling Underground Corrosion," O. C. Mudd, Shell Pipe Line Corp., Houston.

Division of Production

1:30 p.m.—"Operations on the Tidelands," Clayton L. Orn, Ohio Oil Co., Houston; "Operations on Federal Lands in the Rocky Mountains," Lon J. Putnam, Gulf Oil Corp., Denver; "What Should an Engineer Expect from a University Education," Dr. William V. Houston, Rice Institute, president, Houston.

Financial and Accounting

2 p.m.—Address, G. W. Welsch, Lybrand, Ross Brothers & Montgomery, Dallas; Address, Reese H. Taylor, Union Oil Co., Los Angeles.

Division of Transportation

2 p.m.—Pipe-Line Symposium: "Future Development of Lease Tankage," Knox B. Henderson, National Tank Co., Tulsa; "Formulas for Selecting Pipe-Line Diameter for Minimum Investment," George F. Downs, Jr., and George R. Tait, Phillips Petroleum Co., Bartlesville, Okla.; "Oil Across the Rockies," a color movie to be introduced by H. H. Anderson, Trans Mountain Pipe Line Co., Vancouver, B.C.; "Advance in Construction Techniques for Pipe Lines," C. C. Bledsoe, Mid-Western Constructors, Inc., Tulsa.

American Petroleum Industries Committee

2 p.m.—Address, Charles S. Jones, President, Richfield Oil Corp., Los Angeles; Address, Maj. Gen. Frank D. Merrill, New Hampshire Public Works and Highways Commission, Concord, N. H.

WEDNESDAY, NOVEMBER 11

General Session

9:30 a.m. — Remarks, Frank M. Porter, President, American Petroleum Institute; Address, John J. McCloy, Chairman of the Board, Chase National Bank, New York; Address, Hon. Johnston Murray, Governor of Oklahoma.

Group Session—Safety and Fire Protection

2 p.m.—Symposium on Tank-Truck Loading: Moderator, S. D. Clithero, General Petroleum Corp., Los Angeles; Participants, O. W. Johnson, Standard Oil Co. of California; F. R. McLean, Socony-Vacuum Oil Co., Inc., Detroit; S. S. Smith, Shell Oil Co., New York; Frank Baird Smith, Refiners Transport & Terminal Corp., Detroit; J. E. Niland, Humble Oil & Refining Co., Houston; Wiley Butler, Coastal Oil Co., Newark, N. J.

Division of Production

2 p.m. — "Huge Discovery Task Requires More Drilling," Warren L. Baker, Editor, World Oil, Houston; "A Top-Management View of Supervisory and Management Development," O. A. Ohmann, Standard Oil Co. (Ohio), Cleveland; "Aspects of Foreign Oil Development," John R. Suman, Standard Oil Co. (N. J.), New York; "Some Results of DRI Investigations—Rock Failure in Percussion," Dr. John V. Pennington, Drilling Research, Inc., Houston.

Lubrication Section

2 p.m.—Address, C. A. Chayne, General Motors Corp., Detroit; Address, J. E. Dyer, Sinclair Refining Co., New York.

THURSDAY, NOVEMBER 12

General Session

9:30 a.m.—Address, P. C. Spencer, Sinclair Oil Corp., New York; Address, Hon. Lewis W. Douglas, Mutual Life Insurance Co. of New York, New York; Address, Hon. Douglas McKay, Secretary of the Interior and Petroleum Administrator for Defense, Washington, D. C.

Penn State Meeting Set

STATE COLLEGE, Pa.—The seventeenth conference on petroleum production sponsored by the School of Mineral Industries, Pennsylvania State College, will be held here October 28-30 at the School of Mineral Industries.

Technical papers to be presented include:

"Self Potentials of Research Sands," E. B. McConnell; "Progress in Electric Logging Research at Penn State During 1952-53," C. R. Holmes; "Porosity of Sandstones and the Effect of Pre-treatment," P. H. Licastro and J. C. Griffiths.

"Evaluation of Bulk Density in Terms of Rock Properties," J. R. Emery and J. C. Griffiths; "Further Studies on Heat Transfer in Unconsolidated Sands During Water Injection," F. W. Preston and R. D. Hazen; "Hot Water Treatment of Wells to Increase Water Intake Rates," J. N. Breston and B. R. Pearman.

"A Theoretical and Experimental Study of Constant Rate Displacements in Water Wet Systems," C. D. Stahl, J. Jones-Parra, J. C. Calhoun, and R. F. Nielsen; "Effect of Repressuring With Gas on Flooding of Long Cores," R. M. Macfarlane, J. N. Breston, and D. C. Neil; "Capillary Desaturation and Imbibition in Porous Rocks," C. R. Killins, J. C. Calhoun, and R. F. Nielsen.

"Correlation of Oil Residuals Following Surfactant Floods," E. M. Ojeda, F. W. Preston, and J. C. Calhoun; "Laboratory Experiments with Detergents as Water Flooding Additives," H. N. Dunning and Lun Hsiao; "Phase Equilibria for Mixtures of Carbon Dioxide and Several Normal Saturated Hydrocarbons," W. C. Stewart and R. F. Nielsen.

MIDDLE EAST

Iranian Optimism Up

Reports indicate direct discussions between Britain and Iran; Zahedi spokesman says settlement in Iran's interest

THE Iranian Government has given new evidence of a willingness to resume negotiation aimed at settling the 2½-year dispute over nationalization of the properties of Anglo-Iranian Oil Co., Ltd.

In Teheran, a government spokesman representing Prime Minister Zahedi said that a solution of the oil question "in accordance with the aspirations of the Iranian nation and with consideration of the oil nationalization law" is in the interests of the Iranian people.

Reports current both in Iran and Britain are that the two countries may enter into direct negotiations. The United States has served as an intermediary in several previous attempts at settlement. The possibility of direct British-Iranian discussions was given support by an official Iranian statement indicating that a resumption of diplomatic relations with Britain might precede or accompany an oil agreement.

Herbert Hoover, Jr., the new oil policy adviser to the State Department, is scheduled to visit Iran in the near future. Hoover's trip was described in Teheran as a fact-finding mission, and it was said he would have no new proposals from either the United States or Britain.

Oil claims pressed . . . Meanwhile, Anglo-Iranian continued to press its legal claims against the Italian and Japanese companies which have engaged in the relatively small oil trade carried on by Iran since the British company was forced out.

An Italian court in Rome has set November 12 as the date for trial of lawsuits of Anglo-Iranian Oil Co., Ltd., claiming ownership of oil imported to Italy from the company's nationalized properties in Iran.

The court directed that all the British company's cases be combined for a single trial. The actions are against the Italian import companies which shipped the oil from Iran. Anglo-Iranian claims legal ownership on grounds that its properties were taken in violation of contract and without compensation.

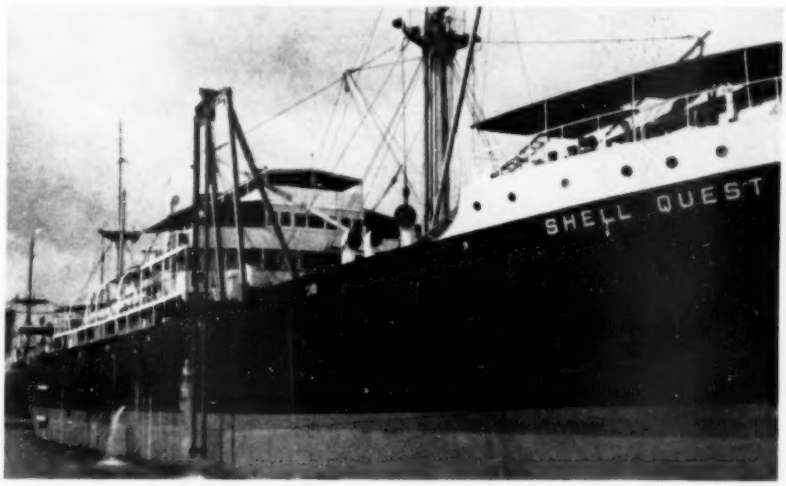
Most of the oil imported to Italy is still tied up in storage because of the Italian Government's refusal to grant import licenses. Hearings opened recently in Tokyo on a similar Anglo-Iranian suit against the Japanese Idemitsu company.

I. P. C. Reviews 1952

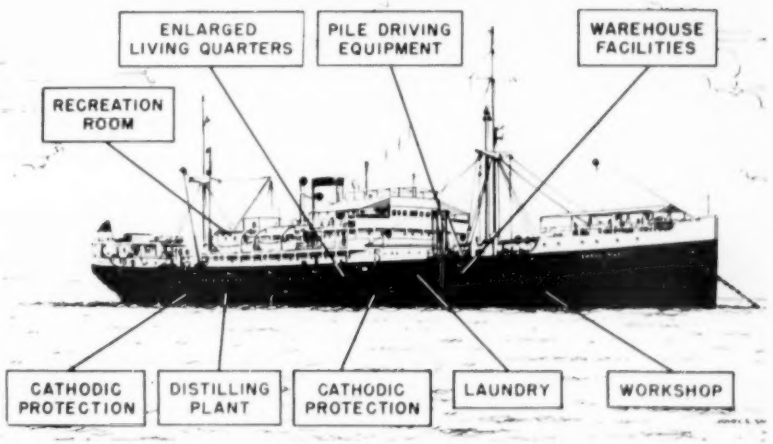
Kirkuk-to-tanker terminal line was big achievement

THE progress made by Iraq Petroleum Co., Ltd., in expanding its production and facilities last year has been reviewed in a recently distributed company publication, "Iraq Oil in 1952."

The story of I.P.C.'s activities centers around three achievements, the most important of which was the completion of the 30 and 32-in. pipe line from Kirkuk field to a new tanker



Merchant Vessel Becomes . . .

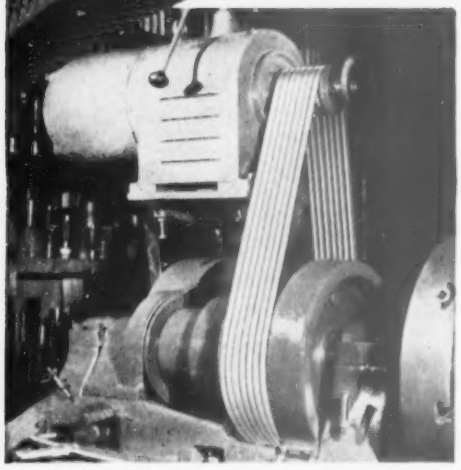


. . . Floating Geophysical Depot

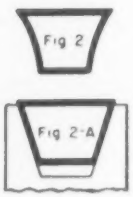
The Shell organization converted this 4,081-ton merchant vessel into a specially equipped depot ship to service geophysical exploration work off Qatar in the Persian Gulf. Formerly carrying timber in the West African trade, the ship was converted in Britain and left for the Middle East in September.

Why Gates V-Belts Wear Longer!

The CONCAVE SIDE
(U.S. Pat. No. 1813698)
tells the story ...



Typical Gates Vulco Rope Drive — the Gates V-Belts are built with Concave Sides to insure longer belt wear.



Take any *straight-sided* V-Belt (Fig. 1). Bend it — as if it were going around a pulley. The sides will at once *bulge out* (Fig. 1-A) — and this causes *extra wear* where the bulge is greatest. (See arrows).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley so that the *full side* takes the wear — and this means longer belt life and *lower* belt *costs* for you!

When you buy V-Belts, always get the V-Belt with the CONCAVE SIDES — the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

CS 539

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

AS A PART OF ITS PROGRAM of training young Iraqi employes, Iraq Petroleum Co., Ltd., is building a new Technical Institute at Kirkuk. Shown here is the nearly completed institute building. Various courses will be taught to 160 full-time, 40 part-time, and 400 adult students.

terminal at Banias, Syria. The line is called the "Third River," a reference which compares its economic importance to the Tigris and Euphrates.

In addition to the completion of the Banias line, Basrah Petroleum Co., Ltd., a member of the I.P.C. group, completed a pipe-line outlet for Zubair field in southern Iraq and began commercial production from this important oil reservoir. The third I.P.C. company operating in Iraq, Mosul Petroleum Co., Ltd., also began commercial operations at Ain Zalah field in the northern part of the country.

H. S. Gibson, I.P.C.'s managing director, in a foreword to the booklet, pointed out that these events brought to fruition the intensive development work of the postwar years. He noted that under the profit-sharing agreement of 1951, Iraq's revenue from operations of the companies last year amounted to £33,000,000 ($92,400,000) and that 70 per cent of this is by Iraq law earmarked for national improvement projects.

Gibson said that the commencement of production from the Mosul concession culminated 7 years of work in the Ain Zalah field. "Unhappily," he said, "the Ain Zalah field is not comparable in size or productivity with either the Kirkuk or Zubair fields, but the drilling of over 100 wells in the Mosul concession has so far failed to reveal the presence of good quality oil in quantities comparable with the other producing fields of the Middle East."

The 555-mile, Kirkuk-Banias line required 165,000 long tons of 32, 30 and 26-in. steel pipe. More than 8,000 men were employed at the peak of construction. Completion of the line made possible a 95 per cent increase in production from Kirkuk which in 1952 totaled 15,552,715 tons (323,000 bbl. daily). Production in December reached an annual rate of 20,000,000 tons (417,000 bbl. daily), and to sustain this, it was necessary to spread withdrawals over both the Avanah and Baba domes. Two separator stations, Saralu and Sarbashakh, were built on the Avanah Dome, a pump station installed, and a 24-in. line laid to move the crude to the process plant at Baba Gugur.

I.P.C. and its two associated companies in Iraq stepped up their activities in the medical, educational, and personnel fields. I.P.C. formed a new department to assist employes to build their own homes. The department handled 371 applications, 211 of which were for home-building. I.P.C. maintained three hospitals and 11 clinics, with in-patient admissions totaling more than 4,000. At clinics and dispensaries, 127,128 out-patients received attention.

Employes of three companies numbered 18,767, of which 3,376 were in the clerical and supervisory classification. Of these latter, 2,744 were with I.P.C., 132 with the Mosul company, and 500 with Basrah Petroleum.

Largest Line in Use

Kuwait's 34-in. crude line links tank farm, terminal

THE world's largest pipe line in crude oil service has been placed in operation by Kuwait Oil Co., Ltd., on the Persian Gulf.

It is a 34-in. gravity-flow line extending about 5½ miles from the company's tank farm at Ahmadi down a gradual slope to the switchgate manifold at the tanker terminal at Mina al Ahmadi.

The new line is buried beside six other lines running from the tank-farm to the terminal, two 22-in., three 24-in., and one 30-in. All the Kuwait production, which in June reached a record of 906,500 bbl. daily, moves through this system.

The use of gravity flow and the large volume of oil produced made the unusually large diameter line appropriate. Three new submarine lines are being laid at the tanker terminal, and when these are completed, K.O.C. will be able to load 13 tankers simultaneously, eight from the T-head jetty and five from submarine lines. Occasional periods of bad weather make necessary tanker loading facilities considerably in excess of contemplated daily production.

An extensive new system of fire-fighting equipment is planned for early installation at Mina al Ahmadi. The equipment includes proportionators mixing water and powder to make a foam which can be thrown a maximum of 90 ft. It will be installed on six K.O.C. tugs for manual operation, and for automatic operation on 12 towers to be erected on the jetty so that at least two streams of foam can be directed on any tanker that might catch fire.

AUSTRALIA

Refinery Started

Caltex refinery at Sydney will go on stream in 1955

PRELIMINARY foundation work has been completed for the new 22,000-bbl. daily refinery which is being built for the Caltex organization at Kurnell, near Sydney, Australia.

Construction of the process units was to get under way in October, and tankage later in the year. A concrete jetty about a mile long has been built in Botany Bay, and a main road connecting with the highway to Sydney is nearing completion.

The refinery will be operated by the Caltex subsidiary, Australian Oil Refining, Ltd. It is one of four new refineries currently being built in Australia. These four plants will raise total Australian refining capacity from approximately 19,000 bbl. daily to around 155,000 bbl. daily. Largest of the four is the 70,000-bbl. daily plant which Anglo-Iranian is building in western Australia near Fremantle.

The main units in the Caltex refinery will be a two-stage crude distillation unit, a 13,000-bbl. daily fluid catalytic cracking unit with gas recovery, a propane dewaxing unit, and a plant for finishing and blending products. Most of the steel and other building materials are being supplied from local sources. Equipment not procurable in Australia will come from sterling-area sources, and, only as a last resort, from dollar suppliers. Special equipment is being

installed to prevent pollution of Botany Bay.

The main contract has been let to the United Kingdom company, E. B. Badger & Sons, Ltd., which is handling the job through a local subsidiary. The plant is scheduled to go on stream by mid-1955.

FAR EAST

Formosa Drilling Studied

American Overseas Petroleum, Ltd. (Caltex) is studying the possibilities of undertaking exploratory operations in Formosa. A group consisting of G. M. Cunningham, American Overseas president; J. M. Kirby, supervising geologist; and W. A. Worton, retired marine corps major, arrived recently in Formosa for a survey.

The Chinese government in Formosa is anxious to have a thorough appraisal of the island's prospects and has indicated a willingness to negotiate an exploration contract. Chinese Petroleum Corp. last year produced 66 bbl. daily of crude and natural gasoline, along with some natural gas, from wells in the foothills area in Formosa. The Mutual Security Administration has sought to encourage a renewal of exploratory activity which dropped off after the failure of two wildcats drilled in 1949 by Chinese Petroleum on the western plains.

EUROPE

New Cat Cracker in Use

A Houdriflow catalytic cracking unit has been placed in operation at the new Lingen-Holthausen refinery of Gewerkschaft Erdoel-Raffinerie in West Germany.

The unit forms the principal processing section of the new 10,000 bbl. daily capacity refinery which was built by the German producing companies, Wintershall, A. G., and Gewerkschaft Elwerath for the processing of Georgsdorf and Emlichheim crudes.

A novel processing plan is employed. A Lummus coker forms part of the feed preparation section for the Houdriflow unit. The total vaporizable effluent from the coker flash tower passes directly to the cracking tower together with gas oils from the topping plant. This integrated arrangement eliminates intermediate storage, thus reducing operating and equipment costs.

The new unit was financed partly with Mutual Security Administration funds and built largely with local labor and materials. Engineering and construction of the plant was handled by Lummus.

Baltic Sea Survey Resumed

Underwater reflection seismograph work in the Baltic Sea off the coast of Schleswig-Holstein has been resumed on behalf of two German oil companies, Wintershall and Deutsche Erdoel.

The surveys are being carried out in the Schwedenneck concession which extends offshore. The German firm, Prakla Gesellschaft fuer Praktische Lagerstaettenforschung, is carrying out the work, using new, smaller and lighter equipment. The same company has done similar work off both coasts of Schleswig-Holstein.

LATIN AMERICA

Financing Planned

McCarthy stock offer set to back Bolivian venture

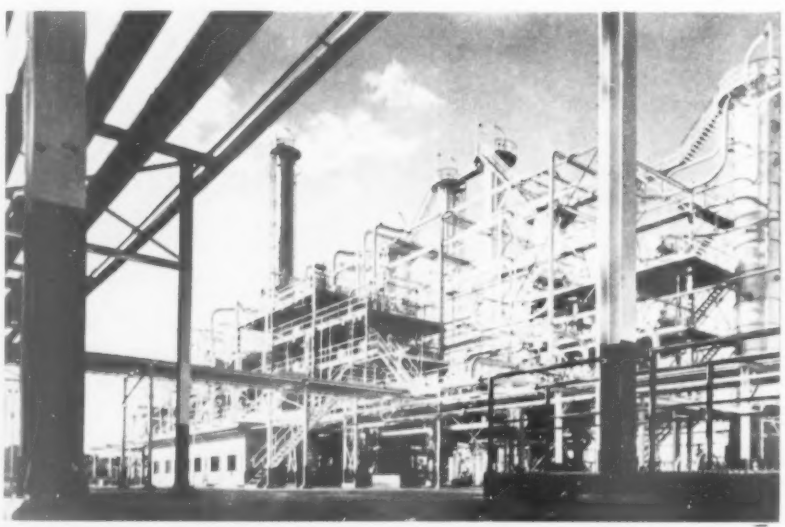
HOUSTON.—Plans are being revived by Glenn H. McCarthy, Houston oil operator, for public financing of his new wildcatting venture in Bolivia.

His company, Glenn H. McCarthy, Inc., which was organized in April 1952, plans to offer 10,000,000 shares of 25-cent par common stock at $2 a share. The offering cannot be made, however, until the Securities and Exchange Commission and the Texas secretary of state clear it.

McCarthy, president of the company, has a 10-year contract under which he would receive a salary not exceeding $60,000 per year plus 10 per cent of the net profits following payment of federal taxes. Proceeds of the stock offering would go partly to finance drilling obligations entered into between McCarthy and the Bolivian Government.

The McCarthy concession, which was granted May 23, covers about 970,000 acres in the Gran Chaco Province of Bolivia. McCarthy agreed to ship a rig and other necessary equipment for the drilling of three wells to 6,000 ft., within 6 months.

Equipment in Houston . . . The first shipment of equipment was made from Cardwell Manufacturing Co., Wichita, to McCarthy in Houston. McCarthy is to assemble the equipment here, test it, then send it to Bolivia.



Shell Plant a Result of Campaign to Use Venezuela's Gas

This installation is illustrative of the efforts being made to utilize the tremendous amounts of gas produced in association with crude in Venezuela. It is a partial view of the Shell gas plant at La Paz field in the western part of the country. Columns, left to right, are: deisobutanizer, topping column (hidden by platforms), stripper, depropanizer, stabilizer, deethanizer, reabsorber (behind stanchion), and absorber. At lower left is the instrument building. The Venezuelan Government and the oil companies are carrying out investigations aimed at utilizing gas in a number of other such projects, and there are hopes for its use as fuel in a future steel industry in the country. Because of the present limited economic outlets and markets, 82.9 per cent of last year's total 737 billion cubic feet of gas production was flared.

Another provision of McCarthy's concession agreement calls for the sending of additional drilling equipment and materials into Bolivia within 1 year from date of the lease, for the drilling of three wells to 10,000 ft.

If oil is found in the concession, the McCarthy company plans to sell it to Bolivia. Any excess would be shipped to other South American countries, probably to Argentina or Brazil. Neither of these countries produce enough oil to meet domestic demands.

Creole Production Drops

Production of Creole Petroleum Corp., the leading Venezuelan producer, dropped back in August for the fourth consecutive month.

The daily average was 670,329 bbl., down 33,966 bbl. from the previous month. Of the August total, 541,411 bbl. daily came from Lake Maracaibo, 6,716 bbl. daily from other western Venezuelan fields, and 122,199 bbl. daily from eastern Venezuela.

Creole's refinery runs during August averaged 86,833 bbl. daily, including 28,235 bbl. daily at Caripito and 58,648 bbl. daily at Amuay. During the month the company operated an average of 21.7 rigs and completed 14 wells, 5 of them successful exploratory tests. In Maracaibo, the company completed three exploratory wells, two producers and one dry. Average initial production of the two oil wells was 1,462 bbl. daily, and average total depth of all three was 8,065 ft. Area initial production, and total depth of the other successful exploration wells were: Orocual, 428 bbl. daily, 6,510 ft.; Cumarebo, 1,104 bbl. daily, 4,005 ft.; and Uracoa, 192 bbl. daily, 4,513 ft.

Nationalist Oil Law Signed

Brazilian President Getulio Vargas has signed into law new Brazilian legislation creating a state monopoly in all phases of the oil business except the marketing of imported products.

The law, under consideration in the Congress for about a year and a half, establishes a 500 million-dollar corporation, Petrobras, to handle oil activities for the government *(The Oil and Gas Journal, October 5, page 153)*. The law is so stringent that even Brazilians married to foreigners cannot purchase the minority shares in Petrobras which will be offered to nationals.

There is serious question as to Brazil's ability to raise the huge sums called for in the Petrobras undertaking. Brazil's foreign exchange position is under almost perennial strain, and there has been difficulty in liquidating debts incurred as a result of normal imports.

AFRICA

Libya Open to Exploration

Libya was opened up to oil exploration recently with the passage by the Parliament of a natural-resources law.

The law allows foreign oil companies to carry out all types of exploration, including drilling, in permit areas. Permits are obtained with approval both of the state and the central government.

Several large oil companies have indicated an interest in exploration in this North African country, the first to receive full independence under United Nations auspices. Libya has an area of 1,100,000 sq. miles and comprises the states of Tripolitania, Cyrenaica, and Fezzan.

Across Libya's western border, in southern Algeria, several French companies are carrying out an intensified exploration program. Two wells tests, neither productive, have already been drilled, and a third is under way.

International Briefs

Communist Czechoslovakia announced recently that its oil industry fulfilled its target for 1953 on September 8, several months ahead of schedule. No figures were given, but western oil experts believe the 1953 goal of both natural and synthetic petroleum was equivalent to about 11,500 bbl. daily. Of this, about 4,000 bbl. daily comes from the small Czechoslavakian fields along the Morava River, and the remainder from the coal-conversion plant at Most in the Sudetenland.

Formation tests are scheduled to be undertaken in the near future in the wildcat, Caparrosa 1, drilled near San Ignacio, Sinaloa, on the west coast of of Mexico by the Mexican operator, Col. Hilario Millan. The well has reached 2,284 ft. and is reported to have had some shows of oil along with considerable gas.

A deep stratigraphic test in the vicinity of Perbersdorf, South Styria, in the British occupation zone of Austria has been drilled to a depth of 6,000 ft. by Col. R. K. van Sickle's Tiefbohrunternehmen. Although drill-stem tests are being carried out, the formation encountered are not promising, and it is not expected the hole will be continued.

A new catalytic polymerization unit has been placed in operation at the Porto Marghera refinery, near Venice, Italy, of Industria Raffinazione Olii Minerali. The company is jointly owned by Azienda Generale Italiana Petroli and Anglo-Iranian Oil Co., Ltd. Further improvement plans for the 28,000-bbl. daily capacity refinery include construction of a catalytic cracking unit within the next 2 years.

Some small-scale exploration work is being carried out in northern Natal by the government of the Union of South Africa. A drilling crew from the government's Irrigation Department is being sent to the area. The limited shallow drilling effort is a part of a government plan started several years ago to search for oil in the country.

Five German geologists and technicians have been retained by the Conselho Nacional do Petroleo of Brazil. Dr. E. Malzahn, of the German Geological Survey, Hanover, is making geological studies on the southern edge of the Maranhao basin. The other four will carry out cartographic work in the Province of Parana with special regard to petroleum geology.

Cumulative production from Kirkuk field in northern Iraq passed the 100,000,000-ton mark early in September, according to an announcement by Iraq Petroleum Co., Ltd. This total is equivalent to about 760,000,000 bbl. on the basis of the 36°-37°-gravity Kirkuk crude. Kirkuk, discovered October 14, 1927, when the famous Baba Gugur well was brought in, currently is producing about 490,000 bbl. daily.

Esso Afrique Occidentale, S.A.F., a marketing affiliate of Standard Oil Co. (N. J.), has opened a new ship fueling station at Dakar in French West Africa. The installation is designed for high-speed delivery of fuels directly to ship bunkers and includes 233,000 bbl. diesel and residual storage. Cost was about $700,000.

Gewerkschaft Brigitta, the Shell-Jersey Standard affiliate in West Germany, has made a field discovery in an exploratory well about 6 miles northeast of Hemmelte field. The well tested at a rate of about 110 bbl. daily of 30°-gravity crude. The discovery is on the Oldenburg concession, held two-thirds by Brigitta and one-third by Deutsche Vacuum.

Check Alters Career

Tool dresser's pay check lured Bass from bank job

A ONE-TIME bank clerk who deserted the banking business more than three decades ago because he was impressed by an oil field tool dresser's pay check, now heads the Texas Mid-Continent Oil & Gas Association.

Harry W. Bass, Dallas drilling contractor and independent oil and gas producer, this month became the fourteenth president of Texas' oldest and largest organization of oil men.

Born in Enid, Okla., the son of a construction contractor, Bass leaped into the oil business in 1919 after serving as an artillery officer in World War I. He was working in a bank, following banking studies at the University of Oklahoma, when he found his $100 monthly pay check compared pretty unfavorably with one for $330 belonging to a tool dresser.

Bass set out to learn what a tool dresser was and headed for Ranger field. He has been in the oil business since.

After 6 years Bass had learned his lesson so well, he formed the firm of Champlin & Bass as a drilling contractor and independent oil operator. The present Harry Bass Drilling Co. operates 18 rotary rigs on locations from the Rio Grande to Peace River, Alta. He formed Can-Tex Drilling Co., Ltd., in 1941 for Alberta exploration.

Bass originated, in 1928, the A-frame portable derrick which is still in use. He formed Trinity Gas Corp. in 1939 and was one of the first to build a cycling plant in Texas as a conservation opeartion in Long Lake field. He later built plants in Grapeland and Sejita fields.

President of Wilcox Trend Gathering System, Inc., Bass also heads Goliad Corp., now building two natural-gasoline plants in South Texas to process 300,000,000 cu. ft. of gas daily.

Affiliated with him in his varied business interests are Bass' two sons, Richard and Harry, Jr. The Bass family has lived in Dallas for the past 20 years.

F. A. (Gus) Thurman, formerly with Pure Oil Co., and Lion Oil Co., has opened offices in Denver as a consultant.

J. D. Dewhurst, petroleum geologist with Burmah Oil Co., Ltd., Karachi, Pakistan, is in the United States on an inspection tour of oil fields and oil-equipment manufacturing centers. He has visited installations in the Los Angeles, Midland, Tex., Houston, and Tulsa areas.

W. L. Kitsman has been promoted by Phillips Petroleum Co. from production superintendent of the eastern Kansas district to assistant superintendent of the company's western region. He replaces **F. W. Akright,** who has resigned. **F. C. Jones** has been transferred from the foreign department to the eastern Kansas district as district superintendent, replacing Kitsman.

Earl E. Marshall, formerly at Omaha, has been made district geologist by Northern Natural Gas Producing Co. and placed in charge of the company's new district office at Denver. The office will supervise exploratory activity in Colorado, Wyoming, western Nebraska, and northwestern New Mexico. Northern Natural Gas Producing is a subsidiary of Northern Natural Gas Co., Omaha.

Walter M. Wilkinson has left Sohio Petroleum Co. to become vice president of Hanley Co. He will manage land and exploration activities of Hanley's oil division and will make his headquarters in Midland, Tex. Wilkinson joined Sohio in 1946 and was Mid-Continent division geologist at Oklahoma City. He also has been associated with Phillips Petroleum Co.

Robert D. Cowdery, senior geologist for Petroleum, Inc., has been placed in charge of the firm's new office in Denver. The company is active in wildcat work through the Denver - Julesburg and Powder River basins.

Robert I. Peters, formerly engineer with Standard Oil Co. of California at La Habra, Calif., has joined Creole Petroleum Corp. as a drilling engineer at Lagunillas, Venezuela.

Floyd W. Findley, of Ohio Oil Co.'s Shreveport division, has been appointed division safety supervisor in charge of accident and fire prevention activities. He has been with Ohio since 1933.

Cecil W. Humphreys has been appointed vice president in charge of manufacturing for Shell Chemical Corp. He previously was general manager and manager of development for the company's manufacturing department. Humphreys joined Shell in 1931 as a laboratory assistant at Pittsburg, Calif., and was later made chief chemist at the firm's Martinez, Calif., plant. He later was assistant superintendent of the Dominguez, Calif., plant, and in 1941 was promoted to manager of the firm's new chemical plant at Houston. In 1946 he became manager of operations in Shell's manufacturing department.

Jean Heim, formerly assistant district geologist at Casper for Stanolind Oil & Gas Co., has opened offices there as a consultant.

Elmer B. Palmer has been transferred by Union Oil Co. of California to its main offices in Los Angeles. He has been succeeded as manager of the firm's Los Angeles refinery by **Henry C. Meiners,** formerly manager of Union's Oleum refinery at Rodeo, Calif. **John W. Towler,** formerly chief refinery engineer at the Los Angeles refinery, has replaced Meiners.

Ernest H. Peterson, head of process and stock coordination at Esso Standard Oil Co.'s Baltimore refinery, has been placed on temporary assignment with the Belgian affiliate of Standard Oil Co. (N. J.). He will train personnel in production and quality scheduling at the new Antwerp refinery. Later this

PERSONALS

year, **Jack Loux,** head of the training division at Baltimore, will leave for the new Alton refinery of the Australian affiliate to aid in training personnel.

Harold Wilkinson, president of Asiatic Petroleum Corp. and a director of Shell Transport & Trading Co., Ltd., has been appointed a director of two other companies in the Royal Dutch-Shell Group — Anglo-Saxon Petroleum Co., Ltd., and Shell Petroleum Co., Ltd. Wilkinson joined Asiatic Petroleum Co., Ltd., in 1922. After service in Singapore and South Africa, he came to the United States in 1931 and about 5 years later was appointed president of Asiatic Petroleum Corp. He was decorated in 1946 by the British Government in recognition of his services as British petroleum representative in Washington. He also is president of Shell Caribbean Petroleum Co., Venezuela.

G. Stewart Brown has been elected national chairman of the Oil Industry Information Committee for 1954. Brown, now public relations manager of Standard Oil Co. of California, succeeds Stanton K. Smith, president of Smith Oil & Refining Co., Rockford, Ill.

Henry E. Zoller, president and general manager of Jet Drilling Co., Inc., has moved his offices from Wichita, Kans., to Denver.

L. F. Stayner has been named assistant to the manager of Shell Chemical Corp.'s Julius Hyman & Co. division. He had been sales manager of the division.

John M. Pierce, vice president and general manager of the Western Oil & Gas Association at Los Angeles, has been appointed director of finance for the State of California. He will assume his new duties November 1.

Mark Olson, formerly manager of operations for **C. J. Brown,** Houston independent operator, has opened offices as a consultant in Rio Grande City, Tex. Before joining Brown in 1951, he had been with Stanolind Oil & Gas Co., and Continental Oil Co. as a petroleum engineer.

L. D. Bechtel has been promoted by Ohio Oil Co. from district superintendent at Lovell, Wyo., to assistant division production superintendent at Casper.

Vincent W. Vandiver, formerly exploration geologist for the western division of Seaboard Oil Co. of Delaware, has been transferred to Dallas as assistant to **R. A. Stehr,** vice president and manager of exploration. Prior to joining Seaboard in 1939, he worked for Standard Oil Co. (N. J.) and subsidiaries and spent 6 years in Venezuela for Creole Petroleum Corp.

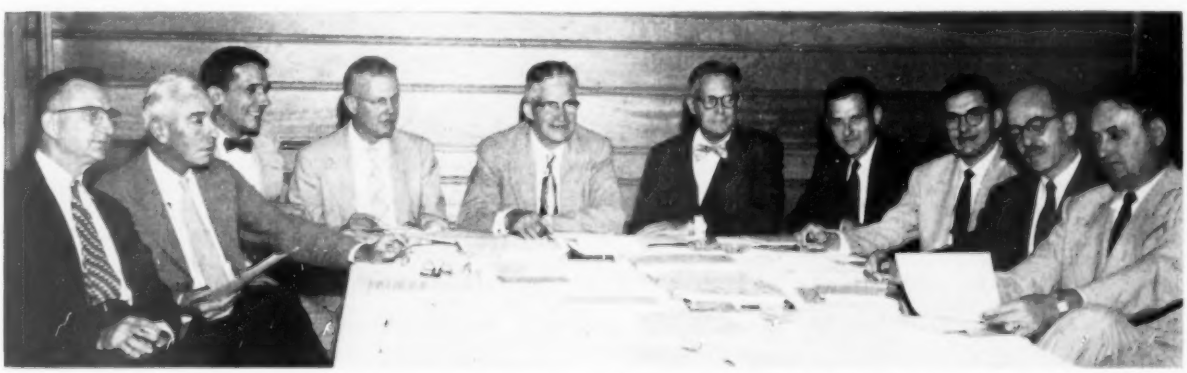
R. C. Brown has been elected president of Hudson's Bay Oil & Gas Co., Ltd., Calgary, Alta. He succeeds **L. F. McCollum** of Houston, president of Continental Oil Co., who has been made chairman of the board. Brown continues as general manager of Hudson, a subsidiary of Continental.

Philip H. Lipstate, Jr., reservoir engineer, has joined the Scurry Area Canyon Reef Operators Committee. He formerly was with International Petroleum (Colombia), Ltd., at El Centro, Colombia.

Warren N. Pearce, geophysicist formerly with Texas Pacific Coal & Oil Co. at Fort Worth, has joined Seaboard Oil Co. of Delaware as division geophysicist at Casper, Wyo.

F. H. RATHJEN

F. H. Rathjen has been appointed manager of Shell Oil Co.'s Tulsa area gas department succeeding **R. S. Harris,** who has been placed on special assignment. Rathjen, a chemical engineer, joined Shell 16 years ago as a technical assistant at the Norco refinery in Louisiana. In 1945 he was appointed assistant manager of the alkylation department of the company's refinery at Wood River, Ill. He was named superintendent of the natural-gas plant at Elk City, Okla., after a 2-year assignment in Venezuela. Prior to his present promotion, he had been on special assignment for a few months visiting company installations throughout the country.



Plans Laid for Annual Exploration Meeting

Committee chairmen for the annual meeting of the American Association of Petroleum Geologists, the Society of Exploration Geophysicists, and the Society of Economic Paleontologists and Mineralogists, to be held in St. Louis April 12-15, met in Wichita following the Mid-Continent regional meeting of the A.A.P.G. Left to right are: R. H. Dott, executive secretary of the A.A.P.G., Tulsa; Norman S. Hinchey, Washington University, St. Louis; Philip C. Ingalls, The Oil and Gas Journal, Tulsa; Alfred H. Bell, Illinois Geological Survey, Urbana; General Chairman Graham B. Moody, Standard Oil Co. of California, San Francisco; General Vice Chairman Noel H. Stearn, W. C. McBride, Inc., St. Louis; John C. Frye, Kansas Geological Survey, Lawrence; Thomas E. Neudecker, W. C. McBride, Inc., St. Louis; Elmer W. Ellsworth, business manager of the A.A.P.G., Tulsa; and Clarence E. Brehm, Mount Vernon, Ill.

PERSONALS

New Officers of the Drilling Contractors

Officers for 1954 were elected by the American Association of Oilwell Drilling Contractors at its annual meeting in Denver, October 4-6. Left to right, seated, are J. S. Bell, Henry Black & Sons, Midland, Tex., vice president for West Texas and New Mexico; J. V. Boxell, Calvert Drilling, Inc., Olney, Ill., vice president for Illinois, Indiana, Michigan, and Kentucky; E. Dale Mount, Harry Bass Drilling Co., Dallas, vice president-at-large; Brad Mills, A.A.O.D.C., Dallas, executive vice president; Karl L. Kellogg, K. L. Kellogg & Sons, Compton, Calif., president; L. A. Beecherl, McDaniel & Beecherl Drilling Co., Dallas, treasurer; and Dee A. Sikes, Helmerich & Payne, Inc., Tulsa, vice president for Central Mid-Continent. Standing are Bert E. Sager, Dunbar Drilling Co., Denver, vice president for Rocky Mountains; Marion S. Church, Dallas, general counsel; Field M. Davis, Field Drilling Co., San Antonio, vice president for Gulf Coast; J. K. Kellogg, K. L. Kellogg & Sons, Compton, vice president for California; and W. L. McClusky, M. J. Delaney Co., Dallas, secretary.

Clarence E. Nelson, independent operator, has moved his offices from Midland, Tex., to Denver.

Declan P. Ford, geologist with Continental Oil Co., at Ventura, Calif., has joined DeGolyer & MacNaughton, Inc., at Dallas.

Joe S. Peerson, formerly district geologist at Lake Charles, La., for Sunray Oil Corp., has been transferred to Midland, Tex.

Charles B. Morgan, formerly district geologist for Lion Oil Co. at Wichita Falls, Tex., has been promoted to regional geologist at Midland, Tex.

Victor S. Clay has been transferred by Shell Oil Co. from Ventura, Calif., to the firm's area offices at Los Angeles as senior mechanical engineer. Other changes in Shell's Los Angeles area production department include **Daniel J. Foss,** Bakersfield, **Ellison Haines,** Los Angeles, and **John A. Haeber,** and **Alexander W. Kerr,** Ventura, promoted from junior mechanical engineers to mechanical engineers; **William Hayes,** junior mechanical engineer at Los Angeles, to mechanical engineer at Long Beach; **Robert M. Hippard,** exploitation engineer at Ventura, to Midland, Tex.; **George S. Kukuchek,** mechanical engineer at Bakersfield, to Ventura; **Charles N. McCollough,** junior exploitation engineer at Los Angeles, to exploitation engineer at Long Beach; **James J. Pickell,** exploitation engineer at Glendive, Mont., to Casper, Wyo.; **Sergio E. Rodriquez,** junior exploitation engineer at Ventura, to exploitation engineer at Long Beach; and **Charles W. Young,** exploitation engineer at Ventura, to Los Angeles.

Herschel E. Zirger, petroleum engineer at New Iberia, La., with The Texas Co., has been granted a leave of absence to do graduate work at Tulsa University.

Nels J. Kirk has resigned as terminal superintendent with Sunray Pipe Line Corp. at Drumright, Okla., to become chief chemist at El Dorado, Kans., for Kaneb Pipe Line Co.

Billy F. Burke, formerly petroleum engineer with Carter Oil Co. at Vernal, Utah, has been made senior petroleum engineer at Denver.

Bascom R. Lynn, petroleum engineer for Gulf Oil Corp., has been transferred from Wickett, Tex., to Fort Worth.

E. M. Benson, Jr., district superintendent at Long Beach for Richfield Oil Corp., was recently elected vice chairman and head of the program committee of the Los Angeles Basin Chapter of the American Petroleum Institute. He succeeds **Marshall Turner,** formerly with Continental Consolidated Corp., who has joined Phillips Petroleum Co. at Bartlesville, Okla.

DEATHS

Walter C. Hardcastle, 69, formerly with E. F. Simms Oil Interests, died recently in Houston.

Joseph H. Lawson, 55-year-old manager of the crude-oil purchase and sales department of Atlantic Refining Co., died recently in Philadelphia. He had been with Atlantic for 40 years.

Robert M. Flanagan, Jr., 24, mechanical engineer for Brown & Root, Inc., pipe-line contractors, died recently in Houston of poliomyelitis.

B. P. Cooper, 69, founder of Cooper Petroleum Co., oil-marketing company, died recently in Houston. He came to Houston in 1916 with Pierce Oil Co., and remained with that firm after its purchase by Sinclair Oil Co., until 1921 when he founded his own company.

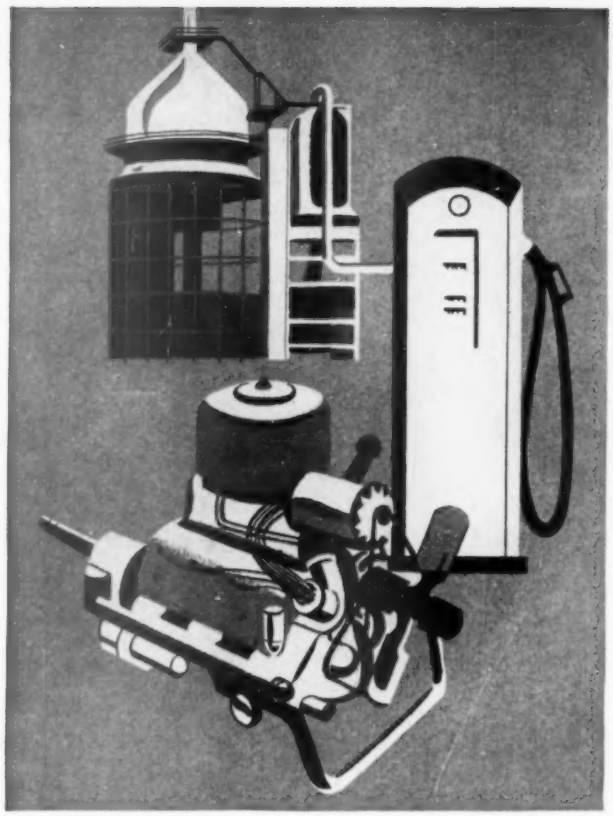
William H. Cain, 66, died October 12 in Tulsa. He retired in 1952 after working 43 years for Sinclair Oil & Gas Co. and Prairie Oil & Gas Co. He also had worked for the Barnes Oil Co. Cain was chief clerk of Sinclair's production department when he retired.

Herschell Ryan Irvine, 54, driller, was killed recently in an automobile accident near Bakersfield, Calif.

Steoppie Gooch, 63, area production superintendent for Gulf Oil Corp., died in Houston, October 11. He had been with Gulf since 1912.

Charles W. Grimes, 77, pioneer Oklahoma oil man, died recently in Tulsa. He was active in drilling, bringing in over 100 producing wells in Osage County, starting in 1909. He also formed Grimes Oil Co. and Grimes Gasoline Co. and built several absorption plants in Oklahoma. In 1920 he helped organize and became treasurer of Hinderliter Tool Co.

William Henry Taylor, 79, who retired in 1945 as zone production superintendent for Gulf Oil Corp. at Kilgore, Tex., died October 14 at his home in Kilgore of a heart attack. Taylor entered the oil industry in 1901, helping to build the first tanks for Magnolia Petroleum Co. at Spindletop. He became associated with Unity Oil Co. in 1903 and joined Gulf in 1916.



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TYPICAL COMPARISONS ON C_5—400°F. ARE SHOWN BELOW:

CATALYST	FILTROL SR		SYNTHETIC SILICA-ALUMINA	
CRUDE	TCC EAST TEXAS	FLUID MID-EAST	TCC EAST TEXAS	FLUID MID-EAST
CONVERSION	56	55.5	56	55.5
OCT. NO.				
F-1 CLR.	92.6	91.9	91.8	92.0
R.V.P.	6.3	6.7	6.4	6.8

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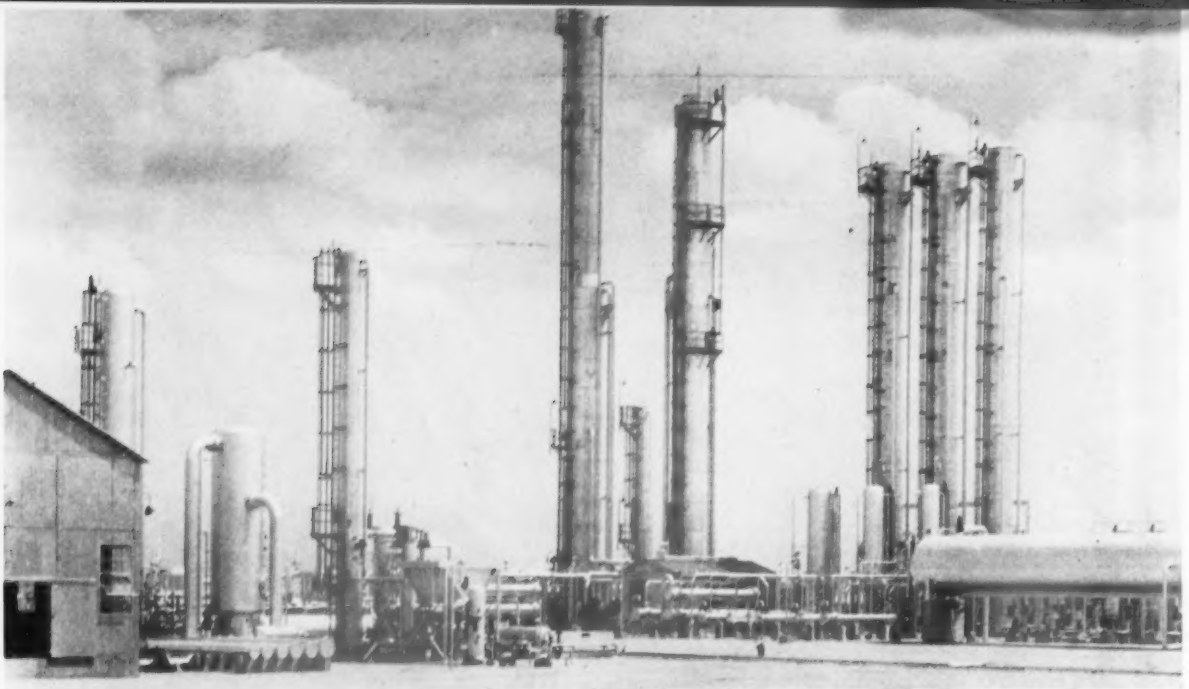
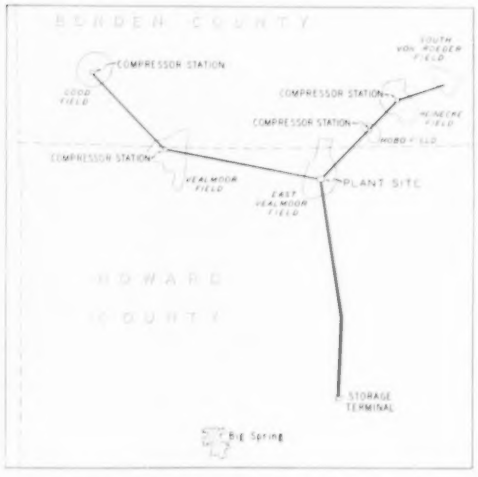


Processing area at East Vealmoor plant. Compressor building at extreme left and M.E.A. sweetening unit adjacent to it. Tall tower is fractionating absorber with still to right. Fractionation section is at right, the three towers in this group being the deethanizer, depropanizer, and debutanizer. The plant recovers 94 per cent of the propane in the casing-head gas feed.

Five-Field Natural-Gasoline Plant

Here are some of the features in the new East Vealmoor plant in West Texas, which processes gas produced from Pennsylvania reef



Map showing location of Reef fields facilities.

by M. R. Lents and W. S. Hudson

● A gas-gathering system which extends almost 30 miles from end to end and which handles all casing-head gas production from five West Texas oil fields.

● A natural-gasoline plant which extracts 291,000 gal. of products per day from casing-head gas while using less than 90 g.p.m. of makeup water which is pumped from wells over 9 miles from the plant.

● All liquid products from the fractionating towers make directly into plant storage tanks 15 miles away.

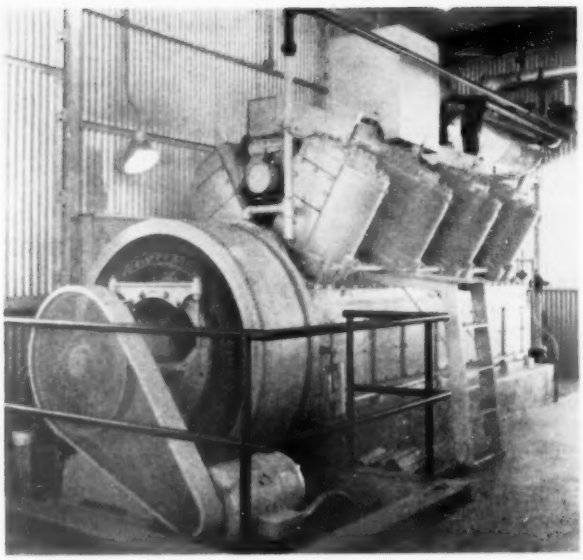
● A gasoline plant processing casing-head gas which contains no reabsorbers or recompressors but which recovers 94 per cent of the propane and essentially all of the heavier components.

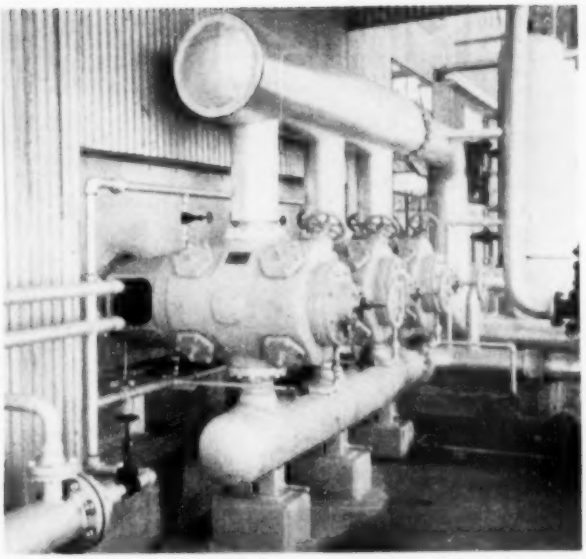
● Utilization of fuel-gas pressure reduction to gas-turbine drive all lean-oil pumps.

● Washing out of salt cavities for underground storage with waste water originally produced from water wells 40 miles away.

● Over 160 miles of field and transfer lines installed as a part of plant operations.

These are some of the unusual features of the East Vealmoor gasoline plant located approximately 25 miles northeast of Big Spring, Tex. One of the larger producers of casing-head-gas products in West Texas, the plant was

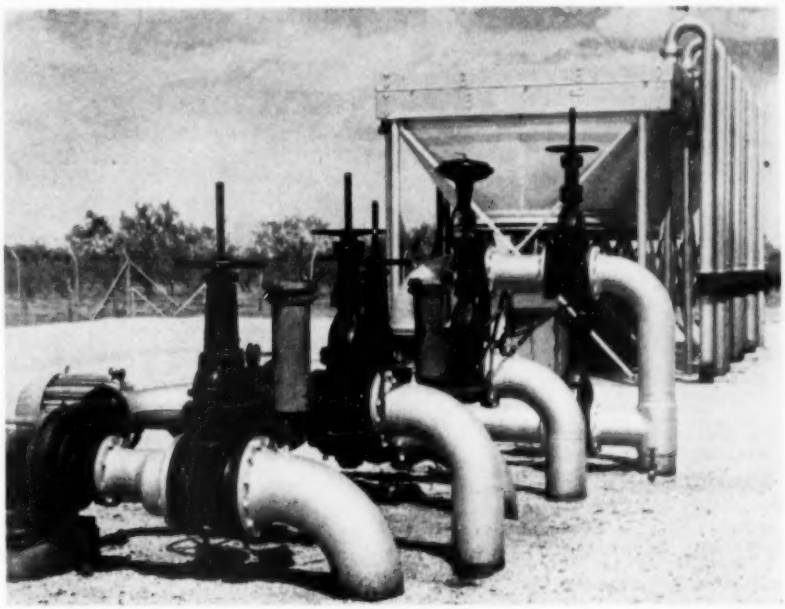




Three 280-kw. gas engine-generator sets normally handle the combined peak electric load of the East Vealmoor plant. The fourth generator unit shown above at the left is used as a spare. During the winter it is employed for power generation, when regular units may be down for repair. The rest of the year it operates in refrigeration service.

placed in operation late in April 1953, processing 35,000 M.c.f. per day of gas produced from the Pennsylvanian reef in Good, Vealmoor, East Vealmoor, Hobo, and Reinecke fields in Borden and Howard counties, Texas. Installations of gas-gathering and compressing facilities for a sixth field is now under way while an extension to a seventh field is being contemplated.

The East Vealmoor gasoline plant, which is located in Howard County, Texas, is operated by Reef Fields Gasoline Corp., of Houston. The joint owners of the plant are Reef Fields Gasoline Corp. and Skelly Oil Co., of Tulsa. The processing plant and central compressor station were designed and constructed by Delta Engineering Corp., of Houston, which company also designed all other compressor stations and the product storage and loading terminal.



Jacket-water cooling manifold at Reinecke compressor station with air coolers in background.

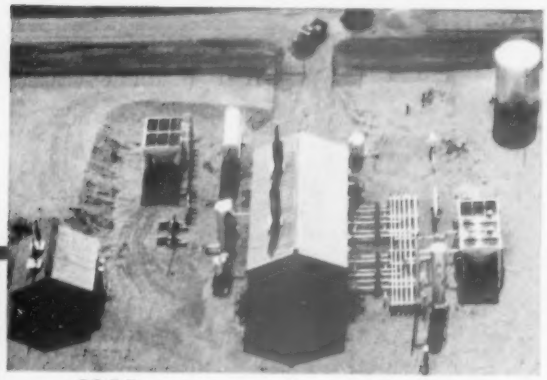
Extent of field . . . The extent of the gas-gathering system, the necessity of transporting water long distances, and the remote location of the processing facilities with respect to a railhead have created unusual problems of design and construction. An inspection of the map shows that the five fields from which gas is now being gathered lie in an arc approximately 25 miles long extending in a general east-west direction. Water for the processing plant is obtained from a water well 9 miles from the processing plant, while the plant storage and loading facilities are located about 15 miles distance away.

A low-pressure gathering system delivers gas from the individual tank-battery separators to a compressor station located in each field where the gas is compressed to somewhat above plant absorber pressure and discharged through transmission lines to the central processing facilities located in East Vealmoor field. Here the gas is sweetened, the products extracted and separated into commercial propane, and specification Reid vapor pressure natural gasoline.

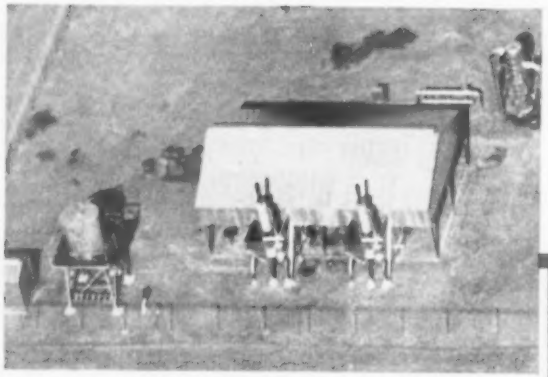
Each of the liquid products flows directly from the fractionating section through an individual product transfer line to a product storage and loading terminal located at the railhead 15 miles from the plant. The residue gas is delived to El Paso Natural Gas Co.'s compressor station near the plant fence where the gas pressure is boosted to that company's transmission line pressure. Despite the difficulties such widespread operations impose upon a continuous process, the plant has proved to be remarkably easy to operate with a conventional number of personnel.

Gas-gathering systems . . . Because of the richness of the gas evolved from oil production in these fields, the gas-gathering system in each field was de-

"FLOW DIAGRAM" OF REEF FIELDS PROJECT



GOOD



HOBO

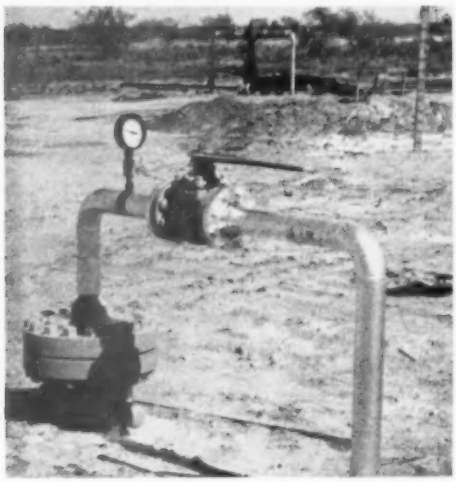
VEALMOOR

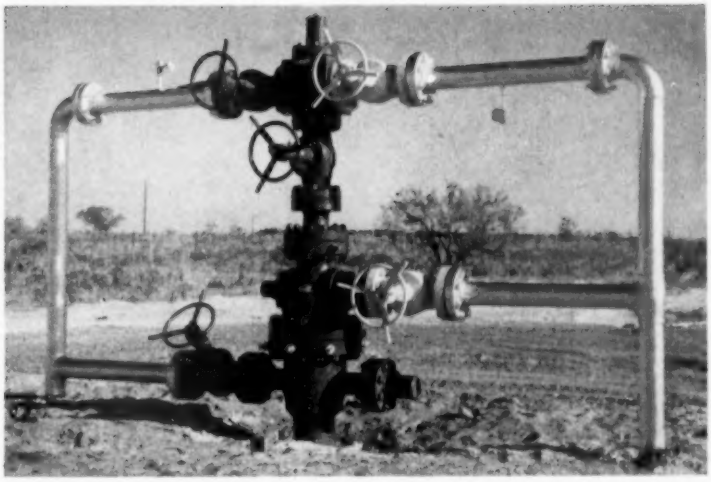
REINECKE

EAST VEALMOOR — MAIN PLANT

The Reef Fields gasoline plant near Big Spring, Tex., handles all casinghead gas production from five different fields (Good, Vealmoor, East Vealmoor, Hobo, and Reinecke) in the Big Spring area. The gas-gathering system extends almost 30 miles, and more than 160 miles of field and transfer lines are in use. Gas-compressor stations located in each of these fields boost field gas to the gasoline plant, as shown in this flow diagram. Residue gas from the plant passes to a booster station and thence into the lines of El Paso Natural Gas Co. Gas-gathering and compressing facilities for a sixth field are now being installed, and extension to a seventh field is being contemplated.

RESIDUE-GAS BOOSTER





Brine obtained from washing out underground storage wells is pumped into this salt-water disposal well (left) for underground disposition. In background is propane underground storage well. Photo at right shows butane storage-well hookup. Injection line for wash water or butane is at left, brine line is at right. In washing operations, wash water is injected into the tubing through the upper left-hand valve and the effluent brine through the wash liner valve at lower right. In storing butane the product is injected into the 8⅝-in. casing through the lower left valve while the displaced brine emerges through the tubing valve at upper right. To remove butane from the well, brine is injected through the upper right-hand tubing valve and the butane displaced through valve at lower left.

Products storage and loading terminal layout. Long, dark oval is brine disposal pit. Aboveground storage facilities are in front of disposal pit with pumps and propane dehydrators located in center between storage tanks.

signed so that oil-gas separation could be made at each lease at separator pressure of approximately 15 psig. (See Table 1 for a representative analysis of field separator gas). A back-pressure regulator is set at each lease separator to prevent excessively low separator pressure and subsequent oil carryover into the gas-gathering system.

TABLE 1
Representative Analysis of Casing-Head Gas East Vealmoor Gasoline Plant

Component	Mol. %	Gallons (M.c.f.)
Hydrogen sulfide	0.03	
Carbon dioxide	0.96	
Nitrogen	3.03	
Methane	47.77	
Ethane	19.18	
Propane	16.69	4.56
Iso-Butane	1.90	0.72
N-Butane	6.10	1.91
Iso-Pentane	1.38	0.50
N-Pentane	1.26	0.45
Hexanes+	1.70	0.70
Totals	100.00	8.84

Gas production from each lease is metered into the gas-gathering system which delivers the gas to the compressor station located in each field at a suction pressure of about 1 psig. Although the soil in the area is generally dry and sandy, all underground piping has been protected against external corrosion with a coating of enamel and glass fiber wrap. The gas-gathering systems comprise a total of approximately 50 miles of light-wall pipe ranging in size from 3 through 12 in. in diameter. Holder Construction Co., of Snyder, Tex., installed the gas-gathering systems, in addition to the product and water transfer lines and the residue gas lease fuel systems.

Field Compressor Stations

The compressor stations range in size from 660 compressor horsepower at Hobo field to 2,860 compressor horsepower at Reinecke field and at East Vealmoor field. The Good field compressor station consists of one 880-b.hp. compressor and one 660 b.hp. compressor. Three compressors are installed at Vealmoor field with 880, 660, and 440 hp., respectively. One 880-b.hp. and three 660-b.hp. compressors are set at each station in Reinecke and East Vealmoor fields.

The casing-head gas produced from each field is compressed through three stages from a suction pressure of approximately 1 psig. to a discharge pressure ranging from 485 psig. at the East Vealmoor plant station to 550 psig. at the Good field station. The inlet gas flows through an inlet scrubber for removal of any scrubber oil, while interstage and final separators remove water condensed during compression and cooling. All compressor stations employ forced air-cooled units for gas, lubricating-oil, and jacket-water cooling; however, the East Veal-

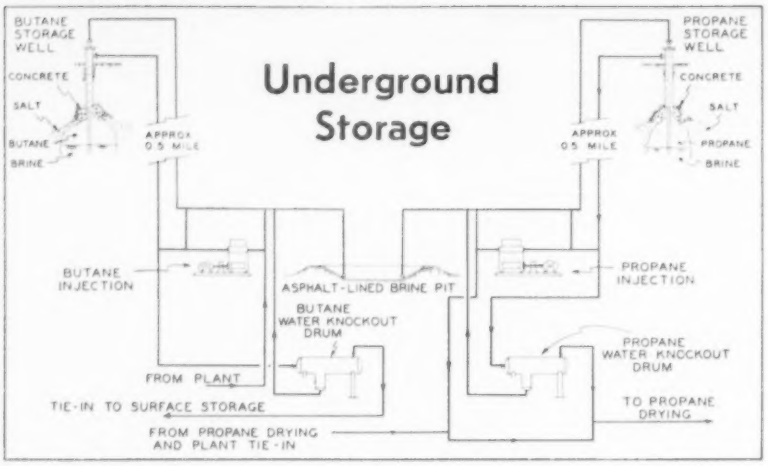
moor plant compressor station utilizes cooling water available at the processing plant for final gas cooling and lubricating-oil cooling. Thus, the remote stations require water, which must be hauled in by truck, only as makeup for the closed jacket-water circulating system.

Hydrate prevention . . . The temperature of the interstage gas is maintained above the hydrocarbon dew point during winter operation by direct temperature actuated devices which adjust shutters on the air discharge of the interstage gas coolers. The final gas temperature is maintained above the gas hydrate point in a similar manner. A final separator equipped with an interphase drainer permits the hydrocarbons condensed in the final stage of compression and cooling to flow into the transmission line with the gas while removing the condensed water and thereby reducing the possibility of hydrate formation in the gas pipe lines to the processing plant.

Electric motors drive all fans and circulating pumps at the compressor stations with the exception of the packaged compression units at Hobo field where the cooling fans and circulating pumps are powered by the compressor engine. Power for fan and pump operation and station lighting at the Good, Vealmoor, and Reinecke stations is generated by industrial-type gas-engine-driven generators. Each of these stations is equipped with a duplicate spare generator. The East Vealmoor plant compressor station is supplied with power and lighting from the main-plant generating station. Hobo station has a small gas-engine-driven generator for lighting purposes.

Motor-driven starting air compressors, spared by duplicate gasoline-engine-driven units, are installed at all stations except that at Hobo field. Each of the packaged compressor units at that field is equipped with a gasoline-engine-driven starting air compressor and an air accumulator tank. Instrument air at the remote stations is supplied by the starting air compressors.

Instrumentation . . . The compressor stations are designed to require the minimum of attention from operating personnel. In addition to the gas-temperature controls maintained above, each station is equipped with a suction-pressure recorder-controller which operates the individual engine-speed controls. These controls are equipped with positioners adjusted so that the compressors are varied, one at a time, through a predetermined speed range to accommodate fluctuations in gas loading. A pilot-operated pressure regulator is also provided to relieve excess inlet gas pressure to the flare stack.



Underground storage facilities flow sheet for Reef Fields plant.

Automatic engine shutdown controls are provided for high inlet scrubber liquid levels, excessively low suction or high discharge pressures, high cooling-water temperatures, low oil pressure, and for engine overspeed. An alarm system, which is actuated by low lube oil pressure on the individual engines, is installed at each of the compressor station residences to warn the operator when he is off duty.

The compressor stations generally operate with only daytime supervision.

Groninger & King, of Pampa, Tex., constructed the compressor stations in Good, Vealmoor, Reinecke, and Hobo fields.

Construction of all the compressor stations was completed before the central plant recovery facilities were ready for operation. Two field compressor stations were placed in operation late in 1952 and the remainder were operating by the end of the first quarter of 1953. During this period temporary facilities were set up to stabilize the compression gasoline product from the compressed gas while the remaining gas was sweetened in the plant gas-treating facilities and delivered to El Paso Natural Gas Co.'s transmission line.

A final gas cooler and a separator are provided for reductiton of water content in the gas discharged into the gas transfer lines between the field compressor station and the processing plant. However, additional cooling in the line causes considerable condensation of hydrocarbons and free water during the winter months. A chemical injection pump is installed at each compressor station so that glycol may be injected into the gas transfer lines during the infrequent periods in which hydrate formation becomes a problem. These pumps are also used for the injection of inhibitor into the gas transfer lines for the prevention of corrosion by the hydrogen sulfide present in the gas.

Central Processing Facilities

During its recent acceptance test, the new East Vealmoor gasoline plant achieved propane, butane, and natural gasoline recoveries of 94.0, 99.3 and 100 per cent respectively. The extreme richness of the input gas stream to the plant is shown by the fact that total daily liquid production amounted to 291,881 gal. when processing 33,830,000 cu. ft. per day of input gas. Despite the high recovery demonstrated, the plant fuel-gas requirement

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including compressor fuel amounted to only 3,428,000 cu. ft. per day, corresponding to an unusually low energy demand for the large amount of liquids recovered and fractionated.

Recovery efficiency is realized primarily through use of a refrigerated fractionating absorber, and thermal efficiency through use of a single absorption oil still operating at 235 psig. and equipped with three waste-heat steam-generator circuits.

As the plant flow sheet shows, the fundamental process flow is very simple and straightforward. Compressed gas from the several fields contributing is separated from condensable liquids at a pressure level of 485 psig., and the liquids are pumped directly to the fractionating section of the plant as deethanizer charge. The input gas phase, together with deethanizer overhead gas, is sweetened in a conventional monoethanolamine plant and passed through the absorber into the sales-gas transmission line.

A stripping section in the base of the absorber drives off all methane and most of the ethane from the rich-oil stream flowing through it, eliminating any subsequent rich-oil flash tanks, reabsorbers, and recompressors, and permitting the still to run totally condensing. Rich oil from the bottom of the absorber flows through a direct-fired heater into a flash zone of the still.

Steam-stripped lean oil from the base of the still is pumped back over the top of the absorber after heat exchange, water cooling, and propane refrigeration to 60° F. Still-overhead product is charged to the deethanizer along with the compression-plant condensate. A subsequent depropanizer and debutanizer complete the separation of deethanizer bottoms into the desired products. Dehydration of sales gas is not a part of the plant's processing responsibility, and is therefore not included.

Fractionating absorber . . . The fractionating absorber is the principal key to the plant's high recovery performance. Forty trays above the point of feed introduction are used for absorption, and nine trays below the feed for demethanizing and partly deethanizing rich oil. Two pumped intercooler circuits are used to maintain a low effective average absorption temperature. Since the feed gas is saturated with water vapor, a design limit of 60° F. was set for refrigeration of lean oil and intercooler return streams to avoid deposition of hydrates in the absorber trays. In operation, however, no evidence of hydrate deposition has been noted at as low as 55° F.

Provision is made for removal of water from the descending rich-oil stream at a point just below the feed and at the base of the absorber. Stripping heat is furnished by means of a forced-circulation reboiler circuit using hot lean oil as a heat source.

Since no attempt is made in stripping the rich oil to deethanize completely, the absorber reboiler outlet temperature is not critical, and needs to be held only within the relatively broad requirements of a totally condensable still overhead product.

Still features . . . A number of unusual features are incorporated in the design of the still. Its operating pressure, 235 psig., is very high for single-stage rich-oil stripping. It is made possible by the relatively heavy liquid knockout at the plant input separator, which is such that virtually no material heavier than hexanes enters the absorber. The soundness of this approach is demonstrated by actual performance, under which the stripped lean oil, a 39°-A.P.I., 195-molecular-weight distillate, shows a 435° F. I.B.P., and is free of hexanes and lighter by precision analytical distillation. Further evidence of complete stripping is offered by low-temperature distillation analyses of absorber residue gas, which have repeatedly shown no detectable quantities of either pentanes and heavier, or of lean oil.

High-pressure operation of the still permits recovery of waste heat by means of shell-and-tube steam generators. One generator uses as heat source the vapors from the stripping section of the still. Thus, the high latent heat content of substantially all of the still stripping steam, instead of being lost to the overhead condensers as in more conventional design, is used instead to generate process steam at a sufficiently high (50 psig.) pressure level to be utilized in the fractionating section reboilers.

Condensed stripper overhead steam, after separation from the lean oil-gasoline mixture which accompanies it, is returned to the plant boiler feedwater system, and the oil phase is pumped to an intermediate point in the rectifying section of the still. A second steam generator is heated by means of an intermediate reflux circuit just above the flash zone of the still and is thus driven by heat originally rejected to the still-overhead condensers. The third still steam generator is heated by stripped lean oil leaving the bottom of the still, which otherwise would contain more heat than is required for its other functions, which are to reboil the absorber and to preheat the feed to the deethanizer.

The combined effect of the three generators is to furnish approximately half of the total steam demand of the entire plant, and simultaneously to reduce the size and capacity of the cooling system by about one-third.

Refrigeration system . . . The refrigeration system for the absorber lean oil and intercooler streams has two rather novel features which appreciably reduced investment cost without penalizing performance. The first of these involves cooling-tower design. Despite the high prevailing summer dry-bulb temperature of the West Texas climate, the wet bulb exceeds 72° F. for only a few hours per year and has an average daily peak of about 70° F. Thus selection of a conventional induced-draft cooling tower for, say, a 6° approach would have resulted in summer cooling water temperatures of about 78° F. maximum.

By selecting a single cross-flow tower, however, and dividing its basin so that approximately 20 per cent of the water from the air inlet face of the tower could be circulated independently of the main water circulation, it proved possible to obtain water at about a 2.5° approach to the summer wet bulb, or at about 75° F. maximum, in sufficient quantity for the needs of the lean-oil and intercooler loads. The summer load on the refrigeration system, which employs propane as refrigerant, was thereby reduced about 30 per cent. As winter approaches, more and more of the chilling load transfers from propane refrigeration to direct water cooling, so that during a substantial portion of the winter no propane refrigeration will be required to hold design absorber operating temperatures.

The second unusual feature of the refrigeration system followed from this light winter refrigeration load, and is related to design of the plant's electric-power-generating station. The combined peak electric load for the plant, including its associated compressor station and camp, is such as to comfortably load three 280-kw. gas engine-generator sets, with a fourth unit as spare. Since such generators are very reliable and regularly attain operating time efficiencies in the high nineties, and since much of their down time can be set up on a planned annual basis, the fourth or spare unit was equipped with propane compressor cylinders as well as with a generator.

Thus the fourth unit can be used as a spare generator during the winter as the regular generator units are shut down for major reconditioning, and as a refrigeration compressor the rest of the year, at little or no loss of plant recovery. The fourth unit has suffi-

(Continued on page 115)

Charles Sweeney, plant manager, and Jim Zike, plant superintendent of Reef Fields Gasoline Corp.'s East Vealmoor plant, check miscellaneous plant temperatures on multipoint electronic indicator.

REEF FIELDS PLANT—INSTRUMENTATION

Modern Process Control At East Vealmoor

Efficient operation of Reef Fields plant is achieved through close control of absorber - still system and fractionation train. Plant instrument system includes force-balance-type flowmeters and electronic temperature controllers employing resistance bulbs for measurement.

by R. S. White

THE new East Vealmoor plant of Reef Fields Gasoline Corp. shows the extent to which modern, efficient control instrumentation is aiding natural-gas processors. The plant, designed and constructed by Delta Engineering Corp. of Houston, first went on stream in April 1953. There are more than 150 recording and controlling instruments in the plant and gathering system.

Feed to the plant is from five separate fields: Vealmoor, East Vealmoor, Good, Hobo, and Reinecke. A compressor station in each field steps up the gas pressure to approximately 460 psi. at the plant inlet, with a total flow of 33,750,000 cu. ft. processed daily.

Processing . . . In the plant the raw gas is first passed through a condensate surge tank with the condensate becoming part of the feed to the deethanizer and the gas off the surge tank going to the amine contactor. The gas passes upward through the contactor, countercurrent to the amine flow, after which the sweet gas off the top of the contactor flows to the absorber. Here the gas flow is countercurrent to that of lean oil, with the sweet gas off the top of the absorber being sold to the pipe line.

The rich oil from the bottom of the absorber is processed for removal of the various hydrocarbons which are then combined with the flow from the condensate surge tank to become the feed to a deethanizer. After the deethanizer, a depropanizer and a debutanizer produce propane, butane, and natural gasoline.

Author is associated with gas industry division, the Foxboro Co., Foxboro, Mass.

Control panel . . . All plant processing is controlled from a single control panel, 17 ft. long and 6 ft., 8 in. high. Occupying an entire wall of the centralized control room, it contains all the important controlling instruments. Various supplementary recording, controlling, and indicating instruments are locally mounted throughout the processing area. All vital supervisory functions and operating control are accomplished at the panel—the nerve center of the entire plant.

This panel was completely prefabricated at the Foxboro plant and shipped to the plant site as a packaged unit. Thus, all instrument mounting, piping, and wiring on the panel were completed prior to delivery. After leads from the process were connected to clearly labeled points on the panel, and electric power and compressed air were supplied, the panel was ready to operate.

The crated panel was received at the plant on March 26 and went into operation on April 10 when the fractionators were put on stream. The entire plant was in operation on April 20.

With the exception of several indicating gages, all instruments on the panel employ pneumatic transmission or electronic measurement. Thus, no dangerous process fluids are brought into the control room and hazardous conditions are consequently reduced. Despite this safety precaution, all back-of-panel wiring is designed to comply with Class 1, Division 2, Group D requirements of the National Electrical Code.

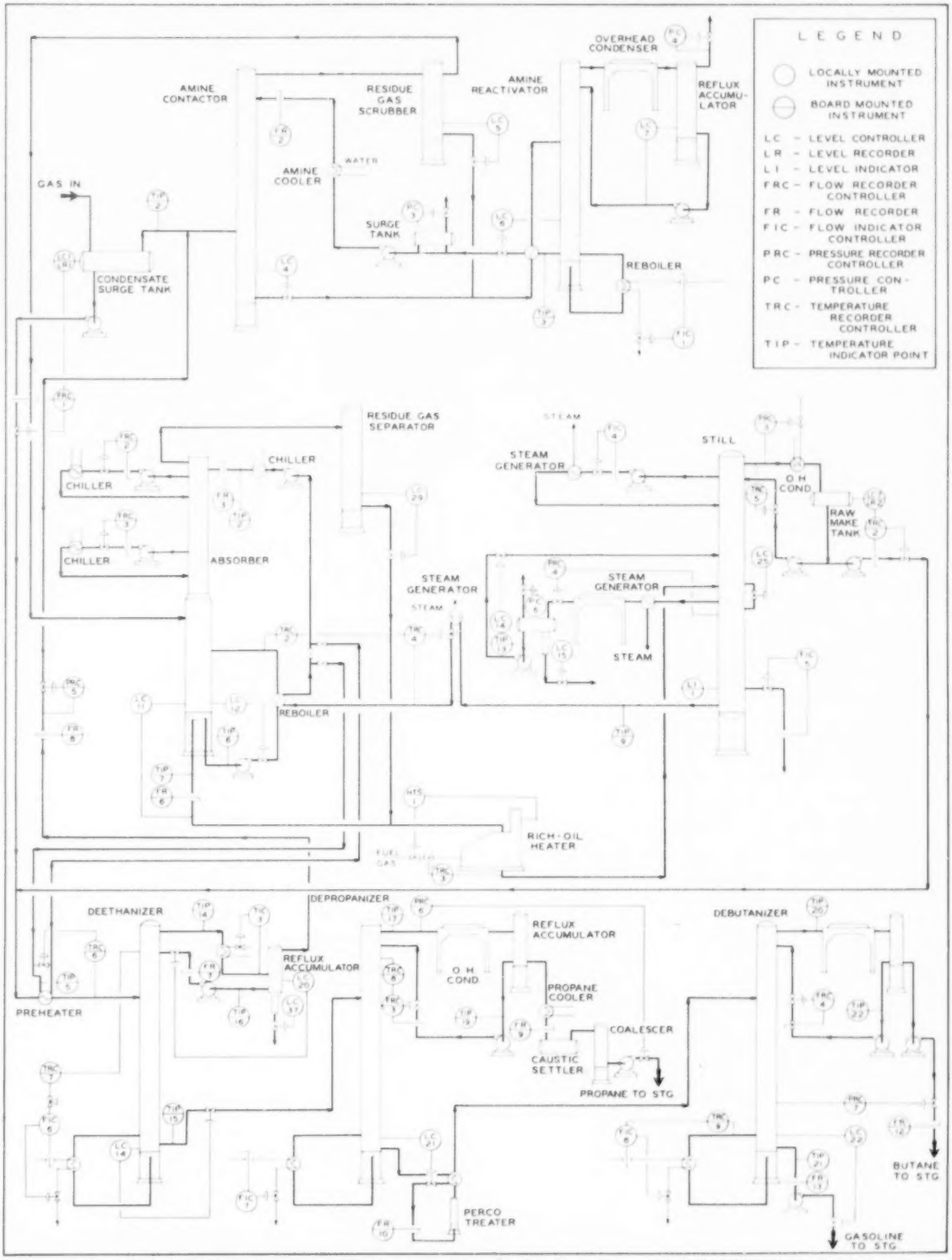
All flow measurements transmitted to the control room are made by pneumatic transmitters (d/p Cells), giving an output signal of 3 to 15 psi. for a change of 0 to 100 per cent flow. These differential pressure cells are of force - balance - type construction, and thus have virtually no moving parts, require no mercury, and have essentially zero volume displacement. They are installed close to the orifice and need no condensate traps or seal pots.

All temperature instruments in the control room are of the electronic type, employing resistance bulbs at the point of temperature measurement, with connections between the bulbs and the electronic instruments made by three-conductor cable.

Process Control System

Plant instrumentation begins with the condensate surge tank which receives the total input feed to the plant. A dual-pilot level controller measures the condensate level in the surge tank and transmits two separate pneumatic impulses to the control room. One impulse pneumatically sets the control index of FRC-1, which controls the

How Reef Fields Plant Is Instrumented



Instrument flow sheet of Reef Fields Gasoline Corp.'s main plant, showing how close control is achieved on absorber, still, and fractionating columns. Residue gas leaves top of residue-gas separator through flow recorder and its flow is regulated by a pressure-recording controller before going into pipe line as sales gas. (Fig. 1.)

Reef Fields Plant—Instrumentation

Local-mounted indicating controllers and transmitters are distributed through process area. Controllers on critical installations are mounted on the central control panel.

How instrument tubing is protected with expanded steel coverings.

condensate flow to the deethanizer. (See flow diagram.)

This pneumatic setting of the control index varies the rate of flow as may be necessary to prevent draining or flooding of the surge tank. The second impulse from the level controller goes to a second recording pen on FRC-1. Thus, both condensate level and condensate flow are recorded conveniently on the same chart.

In the amine contactor the gas from the condensate surge tank passes upward countercurrent to the flow of amine, the amine picking up the impurities in the gas. The amine then goes to an amine reactivator for processing, with the waste gas off the reactivator going to flare. Instrumentation of the contactor and reactor is relatively simple, consisting of virtually all locally mounted controls for level, flow, and pressure. As a control-room check on the operation, the flow of amine to the contactor is recorded as a second record, FR-2, on the still pressure controller, PRC-3.

Absorber instrumentation . . . From the amine contactor the gas goes to the absorber where the heavier hydrocarbons are stripped off. To keep a constant pressure on the absorber, a pressure controller, PRC-2, throttles a control valve in the sales-gas line from the residue separator. A second pen on PRC-2 records the lean-oil flow, FR-3, to the absorber. This record, available at the panel, serves as a valuable check on the operation of the lean-oil circulating system.

Absorber temperature is maintained at the desired value by controlling the temperature at the outlet of the reboiler. This is done by temperature controller, TRC-2, which measures the reboiler outlet temperature and, on the basis of this measurement, pneumatically sets TRC-4 which controls the temperature of the lean oil to the reboiler.

The flow of rich oil from the absorber is under control of a locally mounted level controller. However, since this flow is important to the control-room operator, it is recorded as FR-6 on temperature controller, TRC-3. The latter controls the flow of fuel gas to the rich-oil heater so as to maintain a constant temperature of the rich oil out of the heater.

From the heater, the rich oil flows to a still where the absorbed hydrocarbons are removed. A number of automatic controls are used to insure efficient operation of this still. One of these, a pressure controller, maintains a constant pressure on the upper section of the still by controlling the flow of water to the overhead condenser. The temperature of the still vapors going to the overhead condenser is held constant by TRC-5 which operates a control valve located in the reflux line to the still.

The condensate from the overhead still condenser goes into a raw make tank and a portion is recirculated as reflux, while the balance is pumped to the deethanizer, joining the output of the condensate surge tank to become the feed to that column. Control of the raw make tank is very similar to that of the condensate surge tank.

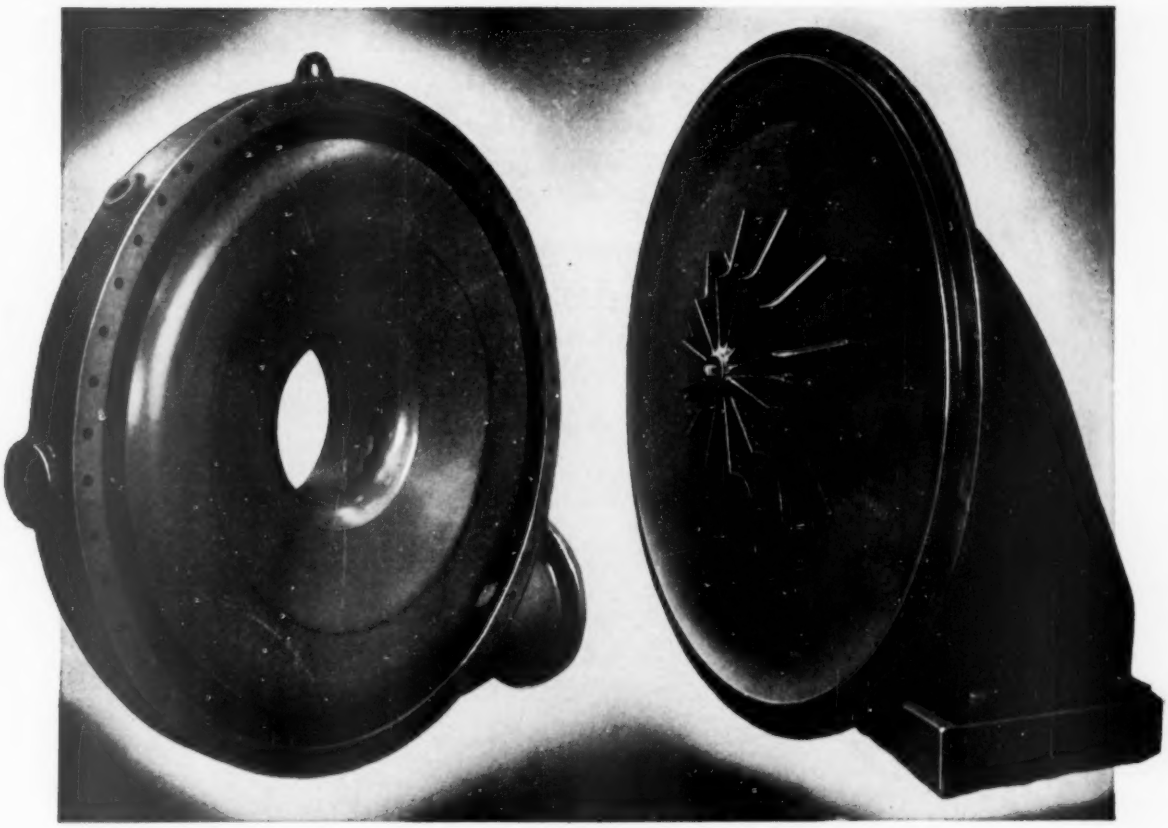
A dual-pilot level controller measures tank level and sets the control index of a flow controller regulating the flow of condensate to the deethanizer. This instrument, FRC-2, also records the level in the raw make tank. Pressure on the lower section of the still is controlled by PRC-4, which varies the flow to the separator.

A further check on the operation of the still is provided by a level transmitter with a 0-20 ft. range float which transmits the level measurement of the lower section of the still to LI-1, an indicator on the control panel. This instrument is equipped with electrical contacts and, by means of three lights in the indicator door, gives the operator a quick visual check on the level in the still.

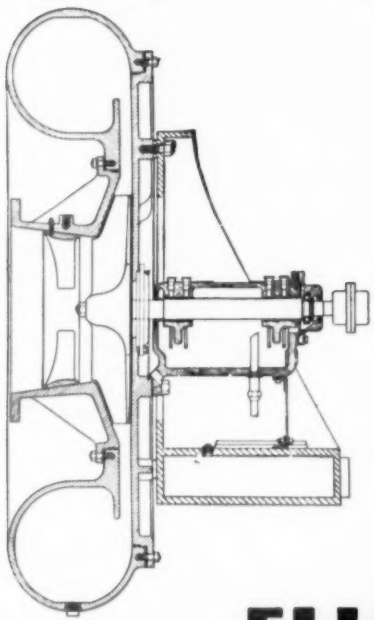
The top, red light indicates that the level is near the top of the still (between 17 and 20 ft.). The middle, opal light is illuminated when the level is in the normal operating range of 5 to 17 ft. The lower, green light signals the operator if the level ever falls within the range of 0 to 5 ft.

Deethanizer control . . . As mentioned previously, the feed to the deethanizer is under flow control, both at the condensate surge tank and at the raw make tank on the still condensate. The combined feed lines pass through a preheater which is under the control of TRC-6 so as to maintain a constant feed temperature to the deethanizer. This close temperature control helps to assure stable operation of the deethanizer. An unstable deethanizer would also upset the operations of the depropanizer and the debutanizer.

A pneumatic-set system maintains control of the deethanizer top temperature. The system consists of a temperature controller, TRC-7, pneumatically setting FIC-6, locally mounted flow controller controlling the flow of 35-lb. steam to the deethanizer reboiler. This cascade setup—the temperature



Simplicity IS THEIR STRONG POINT



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P3-2

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Reef Fields Plant—Instrumentation

pneumatically setting the flow control point—permits precise regulation of the deethanizer temperature regardless of changes in steam pressure upstream of the control valve.

Pressure control of the deethanizer is maintained by means of back-pressure controller, PRC-5, operating a control valve in the overhead line from the reflux accumulator. The overhead from the reflux accumulator joins with the overhead from the condensate surge tank and, as described previously, becomes the feed to the amine contactor. For operational and record purposes, the reflux flow and the overhead flow from the reflux accumulator are both recorded on the control panel.

The forward flow, or feed, to the depropanizer is the bottoms from the deethanizer and is controlled by a locally mounted level controller.

Depropanizer control . . . The depropanizer top temperature is held constant by controlling the rate of reflux rather than the steam to the reboiler as was the case with the deethanizer. While both types of control are perfectly satisfactory, design conditions warranted a different system for each column. A cascade type of control is used for tower-top temperature. Temperature controller, TRC-8, pneumatically sets flow controller, FRC-3, controlling the rate of reflux to the depropanizer.

The pressure on the depropanizer is held by means of PRC-6 which operates a valve in the pump discharge line carrying propane to storage. For operational purposes the flow of propane to storage is recorded as FR-9 on the control panel. The flow from the bottom of the depropanizer is under the control of a locally mounted level controller. Recorder FR-10 provides an operational guide to this forward flow.

Temperature control of the debutanizer is very similar to that of the deethanizer except that the temperature bulb is located near the bottom of the column in the return line from the reboiler. Here again the temperature controller resets a locally mounted flow controller controlling the flow of steam to the reboiler.

Debutanizer pressure control is similar to that of the depropanizer in that the pressure controller operates a valve in the product line of butane to storage so as to hold the desired pressure on the system. Reflux is held constant by means of flow controller, FRC-4, and the flow of natural gasoline from the bottom of the debutanizer is controlled by a locally mounted level controller. A record of this flow is transmitted to the panel.

Other instrumentation . . . Various other instrumentation is also included on the control-room panel. One important device is a 24-point electronic temperature indicator having a range of 0-600° F. Selector switches mounted below the instrument allow the operator to check any of the 24 temperature points as desired, merely by raising or depressing the appropriate switch. The switches are connected to resistance bulbs located at various process points. (Many of these points are indicated as TIP in Fig. 1.)

Also located on the control panel are switches for the operation of the lean oil makeup pump. A manual loading station is also provided for dropping out excess lean-oil inventory from the circulating system. Various gages indicate pressures of the sales gas, plant fuel gas, high and low-pressure steam, instrument air, and cooling water, thus giving the operator a knowledge of these important conditions.

Instrumentation throughout the plant was engineered to provide a high degree of control and efficient operation. To this end, proportional-plus-reset control was provided in all panel-mounted controllers. The desirability of reset action in the controller can readily be seen by comparing its results with those of proportional controllers such as were used in many earlier plants.

Drift (changes of the control index with changes in load conditions) is inherent in any controller which has only proportional action. However, this drift is eliminated by reset action, allowing precise control of temperature, pressure and flow.

Startup of this new Reef Fields plant was trouble free, and the on-stream operations are being carried on with high efficiency. This is due in no small part to the care given to the design and installation of the instrumentation system.

Reef Fields Plants

Five-Field Natural-Gasoline Plant

(Continued from page 109)

cient horsepower to permit a 50 kw. electrical load while in refrigerant compression service which will prevent a plant upset should one of the regular generator units fail.

Fuel gas . . . The fuel-gas supply for the recovery plant and the associated East Vealmoor compressor station and camp originates from the 465-psi. absorber residue gas line, since the process scheme produces no low-pressure gas. The power potential of this gas in dropping from the residue gas line pressure to the 40-psi. level of the fuel-gas system is exploited by passing most of the fuel-gas demand through two gas turbines which drive a pair of triplex high-pressure lean-oil pumps.

Because of the large contribution by the still steam generators previously described, the normal steam demand from the plant's boilers is only about 18,000 lb. per hour. Accordingly, their simplicity and low cost led to the selection of three 150-hp., 275-psig. oil-field boilers for the steam supply source. Two units can carry the normal operating load, so that servicing can be accomplished without interruption of plant operation. The third unit furnishes sufficient reserve for start-up operations and for periodic alternate shutdown of the still steam generators.

Except for still stripping steam and boiler-feed-water pump requirements, the boiler output is stepped down in pressure to 50 psig. for use in the various process reboilers as makeup to the steam furnished by the still generators. The majority of the makeup steam is expanded through back-pressure steam turbines driving the plant's main cooling-water circulating pumps.

Water supply . . . In view of the water-supply problem characteristic of the plant's location, water conservation to the largest practicable degree is an inherent part of the design of the plant and its network of compressor stations. At the plant proper, forced-air-cooled units are used for such services as depropanizer, debutanizer, and amine regenerator overhead condensing, the total direct dissipation to air amounting to about 22 million B.t.u. per hour.

All compressor stations employ fan-cooled units for gas, lubricating-oil, and jacket-water cooling. The compressor station at the recovery plant uses a water-cooled final stage discharge cooler in deference to the importance of temperature on the degree of condensation in the high-pressure input separator of the gasoline plant proper.

Feed water for the steam generators is 100 per cent condensate of negligible solids content, minimizing the need for tube cleaning. The remainder of the available steam condensate is returned to boiler feed water via a deaerating feed-water heater. All water withdrawn from process knockout drums, reflux accumulators, and dehydrator trays is accumulated in a tank equipped for oil separation and then used for boiler feed. A zeolite treater is used on the

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small amount of water necessary to replace cooling-tower evaporation lossses and blowdown, boiler system blowdown and deaerator vent losses, and domestic water demand.

Plant flexibility . . . Although the plant incorporates a number of unusual features, its fundamental design simplicity results in an ease and flexibility of operation which are best illustrated by two incidents in its early history. Toward the close of construction, it became apparent that the distillation section of the plant comprising the three product fractionators could be completed several days ahead of the absorber and the still.

Accordingly, the plant was operated for about 2 weeks very satisfactorily on a simple compression gasoline operation by charging plant input separator liquid to the deethanizer, thus recovering nearly all of the gasoline in the input gas, as well as appreciable quantities of propane and butane, and demonstrating a very useful plant flexibility.

On another occasion after the entire plant had been in operation about 3 weeks, a field line failure resulted in a complete plant shutdown for a day. Although plant personnel had had only the 3 weeks' time to become familiar with the plant, it was brought up from a cold start to full specification production in 4 hours.

The plant design was directed toward obtaining a stable, easily operated, easily and economically maintained, high-service-factor plant. The plant layout was further planned to facilitate any proposed plant extensions.

All pumping equipment is installed outdoors, adjacent to the equipment served. Virtually all process pumps are of the vertical centrifugal type, electric-motor driven. The lean-oil pumps are of the vertical power-type driven by expansion gas turbines through gear-reduction units. Vertical centrifugal cooling-water pumps are driven by back-pressure steam turbines. Mechanical seals have been provided on all centrifugal pumps in hydrocarbon service except when prevented by temperature limitations.

Electric power, generated by gas-engine-driven generators, is distributed over a three-phase system operating at 480 volts and 60 cycles.

Process equipment is compact for ease of operation and all heat-exchange equipment is accessible on ground level for ease of maintenance.

Plant maintenance is further reduced and inspection facilitated by carrying all process and utility piping except water on reinforced concrete piers 1 ft. above grade.

The plant is controlled by an advanced design instrumentation system. For operator convenience all key controls and instruments are located in a control room centrally located to the process area. All process variables are transmitted to receivers in the central control room by transmitters located adjacent to the process function served. Measurement is effected by mercuryless flow transmitters, pressure transmitters, and resistance bulb temperature instruments. Instrument lines are located to facilitate inspection and maintenance and are protected by hail screens. Instruments are steam traced for cold-weather protection.

Safety features . . . The plant facilities embody all safety measures inherent in a plant designed and constructed in compliance with the various codes and regulations which establish and define safe practices as recognized by the industry as a whole. The provision of adequate alarm systems, for high and low levels; the installation of automatic shutdown devices for the oil heater and compressors all sustain a program of planned safety.

Other safety precautions include the provision for adequate lighting for night operation, the maintenance of adequate head room throughout the plant, the installation of safety cages on all ladders 15 ft. or more in height; the installation of chemical-type extinguishers, smothering steam facilities, and fire hydrants at points throughout the plant. All direct-fired equipment and nonexplosionproof equipment is located far enough from the process area to eliminate any reasonable fire hazard.

Further to provide better safety protection for personnel and plant equipment, the venting of combustible hydrocarbons in the process area is minimized by discharging relief valves and vents into both high and low-pressure flare headers piped to a pilot-lighted burning pit located outside of the plant area. The atmospheric oil-storage tanks are enclosed by adequate earthen fire walls to confine the contents in the event of a tank fire.

The plant and station areas are surfaced with 5 in. of compacted caliche covered with asphalt and topped with pea gravel to minimize the effect of dust storms. Plant areas are enclosed by fences.

Product Storage and Loading Terminal

The plant storage and loading facilities are located on a 43-acre site between the Texas & Pacific Railway and U. S. Highway 80 about 15 miles south of the plant. The plant general office is also located on this site.

The plant products, propane, butanes, and natural gasoline, flow directly from the fractionating section to the storage terminal through three product transfer lines which are sized 4, 3½ and 3 in. respectively. Double block valves with a bleeder between are located at several points in each line so that any spot in the line may be repaired without the necessity of bleeding down the entire line.

Steel storage facilities at the terminal include three 1,250-bbl. gasoline-storage tanks, two 1,000-bbl. butane-storage tanks, five 1,000-bbl. propane-storage tanks, and three 1,000-bbl. tanks which serve as storage either for butane or L.P.G. mixture. A 15-car twin-spot rail loading rack and a six-spot truck-loading rack plus a 50-ton truck scale comprise the product-loading facilities.

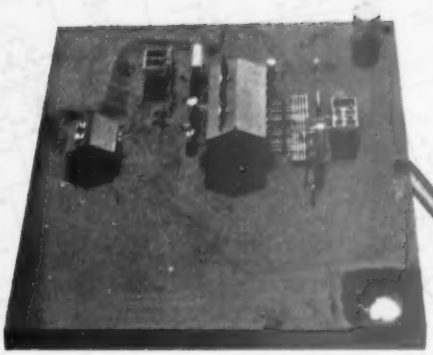
Water knockout drums are provided for removal of free water from the propane and butane, and the propane is dehydrated by means of a fixed-bed solid-desiccant dehydration unit. The desiccant is regenerated by circulating vaporized propane through a salt-bath-type direct-fired package-type heater into the desiccant bed. The dehydration unit consists of two dehydrators so that one may be in operation while the desiccant in the other is being regenerated. The dehydrators are sized to handle high rates or propane withdrawn from underground storage in addition to the normal plant production.

Underground storage . . . A program of leaching out the underlying salt beds for use as underground storage for propane and butane has been under way since early this year. Although the present total capacity of the five storage wells which have been drilled is less than 2,000,000 gal., it is planned to continue the washing process until an ultimate 10,000,000 gal. of underground storage capacity is obtained.

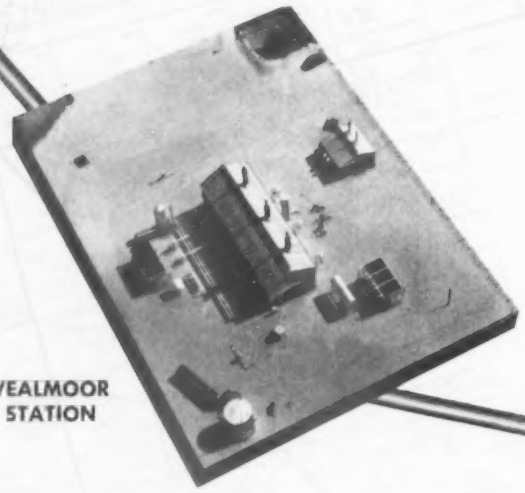
The development of underground storage has been at a slow rate from the beginning due to the lack of sufficient water used in the washing process. Fresh water is available from shallow sands in the area but the community of Sand Springs nearby depends upon this supply for domestic use, so no attempt was made to obtain water from this source. A test well was drilled to 1,000 ft. to determine if brackish water in the Triassic sands was available in the required quantities but the yield was so small that this plan was abandoned.

Cosden Petroleum Corp. offered the use of waste water from its Big Spring refinery which is 5 miles to the west of the storage terminal. A 4-in. pipe line was laid from the Cosden refinery to the storage terminal and an electric-motor-driven centrifugal pump was set

REEF FIELDS PROJECT

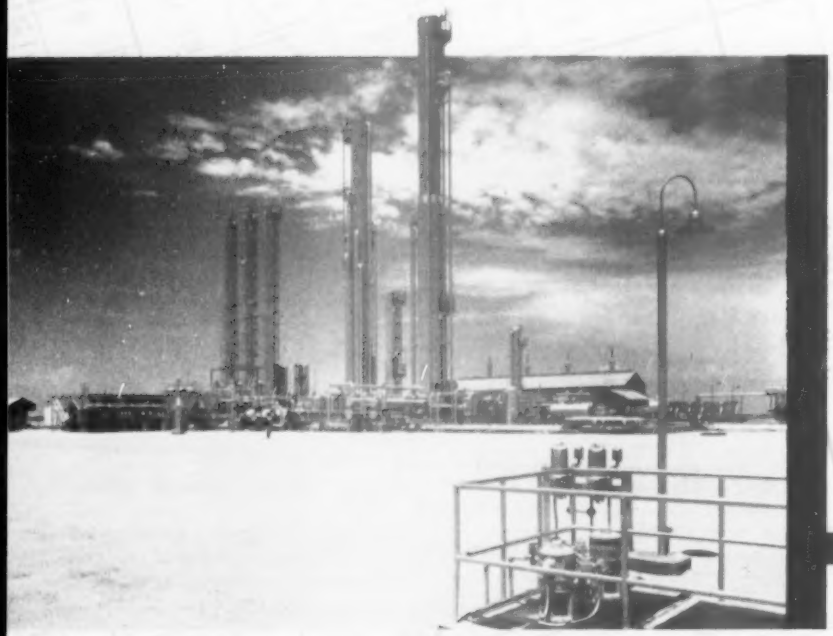


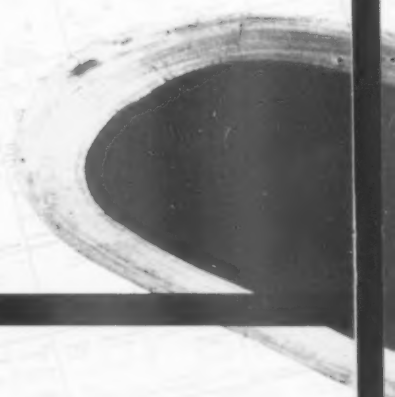
GOOD FIELD STATION



VEALMOOR STATION

Delta is proud to have had prime contract responsibility for the process facilities in the great new gas conservation project recently completed in Borden and Howard Counties, Texas, by Reef Fields Gasoline Corporation and Skelly Oil Company. Typically this Delta installation went on stream smoothly and met exacting performance guarantees comfortably. Typically, too, this Delta installation was completed expeditiously and within its assigned budget. Why not put Delta's experience to work for you? Consult us on your future plans.





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DESIGNING ENGINEERING DELTA CONSTRUCTION

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Precision die-formed crowns interlocked with the inner liner under 40 tons pressure give more than just a "new look" to IGLOO Water Cans and Coolers. This new construction adds greater strength . . . assures better fitting lids that are easy to remove . . . provides more protection against rough handling . . . and makes IGLOO a better buy than ever. Still more news: **IGLOO Water Coolers are now available in the convenient 2-gallon size.** All coolers have **flush-mounted spigots** . . . positive protection against breaking off. Be sure you get the finest in water cans and coolers . . . be sure to say IGLOO. Your supply store has them.

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We are pleased to have furnished the Reef Fields Gasoline plant with six Le Roi L 3000 generator units.

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Reef Fields Plants

at the refinery to pump the water to the storage terminal. This water had originally been reclaimed by Cosden from sewerage system effluent from the city of Big Spring, which in turn had obtained the fresh water from well fields in Martin County. Thus the water was piped some 40 miles and used two times before arriving at the storage terminal to be used for the third and final time and then returned underground via a disposal well.

The salt beds underlying the storage terminal area are not homogeneous but contain numerous stringers of shale and anhydrites of varying thickness. The salt bed exists at a subsurface depth of about 800 to 2,000 ft., but the best section appears to be between 900 and 1,300 ft. Consequently, all five wells were completed with the casing set at about 900 ft. and with the open hole extending to a total depth of 1,300 ft.

Washing out the supporting salt has caused many of the shale and anhydrite stringers to break off and fall to the bottom of the cavity. In a number of instances falling shale has kinked or sheared the wash tubing which extends to total depth. This has disrupted and delayed the washing process, but such difficulties had been expected and the underground storage program is continuing at a reasonable rate.

Protection of the casing seat was accomplished by hanging a string of pipe between the wash tubing and the casing to a depth about 50 ft. below the casing seat. By filling the annulus behind this liner with the product which is to be stored in the well, and then circulating the wash water through the tubing and out the liner, it has been possible to wash out the salt cavity without the danger of eroding the formation near the casing point.

The problem of disposing of the effluent brine from washing the storage wells has been solved to date by injecting the brine into a non-oil-producing horizon beneath the salt beds. One disposal well has been drilled for this purpose and has been taking approximately 5,000 bbl. of brine per day at an injection pressure of about 400 psi. An asphalt-lined earthen pit with a capacity of 250,000 bbl. was also constructed for disposal of brine at times when the injection system is out of service and to provide a permanent source for storage of brine to displace the products stored underground.

Product system . . . Although the storage terminal is 15 miles from the plant, and an additional 5-mile extension of the gasoline pipe line from the storage terminal to the Cosden refinery adds to the widespread operations, the product transfer system has been designed for very flexible operation. Butane or propane produced at the plant can be stored in steel tanks at the plant (when products are off specification or terminal storage is full) or at the storage terminal, or can be pumped directly from the plant into underground storage at the storage terminal.

These products can also be transferred from steel storage to underground storage or vice versa. Butane and propane can be blended to required L.P.G. specifications by means of a ratio flow controller. This blending can be accomplished straight from the product lines or by transferring products from steel or underground storage. The natural gasoline can be stored either at the plant or at the storage terminal and then pumped directly to the Cosden refinery from either storage area. The storage at the plant permits rerunning of contaminated or off specification products which may be produced.

Construction of the product storage and loading terminal facilities was performed by J. E. Carlson, Inc., of Pampa, Tex.

Plant water supply . . . Although a number of the nearby ranches obtain water for domestic use from wells, a thorough study of the producing sands indicated that this source of water supply was not adequate for long-range plant requirements. Consequently, plant water is obtained from water wells located 9 miles from the plant.

The water is pumped from five wells in the field to a 4,000-bbl. surge tank at the water transfer terminal nearby. Gas-engine-driven centrifugal pumps transfer the water through 9 miles of 6-in. pipe to the plant. A propane gas pipe-line system which provides fuel for the transfer pumps and the water-well pumps is supplied from propane tanks which are located at the water transfer terminal. Low-discharge-pressure shutdown switches on the transfer pumps allows continuous operation of the station with only periodic inspection.

The water is received at the plant in two 4,000-bbl. raw-water storage tanks. Liquid-level controls on these tanks actuate a motor valve on the intake line while a small bypass around the control valve allows sufficient water transfer to prevent overheating the water transfer pumps if the control valve completely closes. The raw water is treated by a zeolite softener and stored in a 4,000-bbl. treated water-storage tank for plant use.

Company houses are provided for approximately 50 per cent of the operating personnel with a total of 19

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J.L.

STOCK LIST

COLD DRAWN SEAMLESS MECHANICAL TUBING
COLD FINISHED STEEL BARS • STEEL TUBING

COLD DRAWN SEAMLESS MECHANICAL TUBING

GRADE MT-1015 RANDOM LENGTHS, 17-24 FEET

O. D.	Decimal Wall Gauge	Quantity in Feet
1/4"	.022	1,995
3/8"	.065	5,203
5/16"	.035	226
	.049	54
	.065	1,114
	.083	784
5/8"	.065	19,640
3/4"	.083	240
	.120	495
	.156	*
	.188	50
7/8"	.083	1,248
	.109	1,667
	.120	1,904
	.156	2,396
	.188	1,882
1"	.120	1,465
	.156	1,969
	.188	103
	.250	886
1-1/8"	.120	1,754
	.188	305
	.250	962
1-3/16"	.188	1,328
1-1/4"	.120	1,701
	.156	3,842
	.188	2,309
1-5/16"	.120	868
	.156	1,178
	.188	1,124
	.218	987
1-3/8"	.065	56
	.120	1,265
	.188	*
	.218	*
	.250	509
1-7/16"	.156	1,213
	.188	62
	.250	987
1-1/2"	.035	111
	.120	1,761
	.156	2,268
	.188	260
	.218	*
	.250	22
	.313	643
	.375	*
1-9/16"	.250	*
1-5/8"	.095	475
	.120	*
	.188	750

O. D.	Decimal Wall Gauge	Quantity in Feet
1-5/8"	.218	*
	.250	812
	.375	*
	.438	*
1-3/4"	.120	*
	.188	832
	.218	691
	.250	*
	.313	*
	.375	84
	.500	*
1-13/16"	.188	91
	.313	138
1-7/8"	.120	1,181
	.156	371
	.218	675
	.375	414
2"	.065	1,023
	.095	*
	.120	1,600
	.156	774
	.188	707
	.218	*
	.250	553
	.281	*
	.313	509
	.375	411
	.438	64
	.500	*
2-1/8"	.125	*
	.188	643
	.218	*
	.250	504
2-1/4"	.065	446
	.120	1,647
	.188	1,204
	.218	626
	.250	203
	.375	*
	.625	*
2-3/8"	.156	1,221
	.188	25
	.220	*
	.281	*
	.313	*
	.500	*
2-1/2"	.095	410
	.120	896
	.219	512
	.250	1,024
	.313	*
	.375	358

O. D.	Decimal Wall Gauge	Quantity in Feet
2-1/2"	.438	147
	.500	*
	.750	*
2-3/4"	.120	529
	.188	454
	.250	29
	.375	*
	.500	377
2-7/8"	.188	*
	.218	903
	.250	*
	.438	*
3"	.120	247
	.156	491
	.188	869
	.218	408
	.250	294
	.375	18
	.500	*
	.562	*
3-1/8"	.188	*
3-1/4"	.120	501
	.188	*
	.250	5
	.375	*
	.500	98
3-3/8"	.188	1,091
	.375	*
3-1/2"	.120	100
	.188	*
	.218	7
	.250	592
	.313	338
	.375	*
	.500	*
	.625	*
3-5/8"	.188	118
	.313	102
	.375	*
	.500	*
3-3/4"	.120	*
	.188	113
	.250	*
	.500	*
4"	.120	*
	.188	267
	.250	197
	.313	*
	.375	*
	.500	*
4-1/2"	.250	207
5"	.250	*

* These items are on order. Delivery expected early third quarter. Consult us for sizes not shown.

COLD FINISHED STEEL BARS

QUANTITY IN POUNDS

ROUNDS

R-33		C-1018-20	
15/64"	153	1/4"	197
11/16"	11,020	5/16"	4,060
1"	9,299	3/8"	4,968
1-1/16"	7,406	9/16"	4,473
1-3/8"	8,237	5/8"	10,000
1-7/16"	32	11/16"	6,046
1-1/2"	6,501	3/4"	5,560
1-9/16"	2,416	13/16"	11,435
1-5/8"	1,981	7/8"	10,800
2"	8,441	1"	12,355
2-3/4"	9,491	1-1/8"	12,350
		1-3/16"	13,839
C-1213		1-1/4"	15,822
5/16"	1,780	1-5/16"	6,152
3/8"	9,300	1-3/8"	10,200
7/16"	8,603	1-7/16"	8,331
1/2"	5,761	1-5/8"	16,059
9/16"	253	1-11/16"	5,590
5/8"	5,714	1-15/16"	3,278
11/16"	6,112	2"	11,939
13/16"	3,506	2-1/16"	2,689
15/16"	6,140	2-1/4"	1,200
1"	523	2-5/16"	1,798
1-1/8"	5,780	2-3/8"	1,838
1-3/16"	3,287	2-9/16"	4,220
1-11/16"	6,050	2-5/8"	6,565
1-3/4"	10,390	2-3/4"	1,435
2-15/16"	6,350	2-7/8"	2,362
		2-15/16"	3,200
		3"	7,546

SQUARES

R-33		C-1213	
3/16"	1,379	7/16"	3,732
5/16"	536	5/8"	6,320
7/16"	2,908	13/16"	2,013
1/2"	1,225	1"	49
		1-1/16"	480
C-1213		1-1/8"	1,515
3/16"	862	1-3/16"	1,381
9/16"	2,279	1-3/8"	1,456
5/8"	10	1-1/2"	3,848
7/8"	5,373		
1"	19		
C-1018-20			
1-1/2"	19		

HEXAGONS

R-33		C-1213	
5/8"	689	7/16"	3,732
1"	2,354	5/8"	6,320
1-1/4"	99	13/16"	2,013
1-1/2"	27	1"	49
		1-1/16"	480
C-1213		1-1/8"	1,515
7/16"	3,732	1-3/16"	1,381
5/8"	6,320	1-3/8"	1,456
13/16"	2,013	1-1/2"	3,848
1"	49		

FLATS C-1018-20

1/8	x 1-3/4	1,440	3/16	x 2	796	1/4	x 4	1,229
	x 2	3,230		x 4	1,651		x 6	3,508
	x 2-1/4	42		x 6	1,213	5/16	x 1-1/2	1,934
	x 2-1/2	2,187	1/4	x 1-1/2	466		x 2	3,027
	x 3-1/2	3,967		x 1-3/4	2,130	3/8	x 1-1/2	3,374
	x 4	2,392		x 2	2,157		x 2	2,024
	x 6	66		x 2-1/2	2,780		x 4	2,045
3/16	x 1-1/2	2,111		x 3	460	1/2	x 1-1/4	4,043
							x 4	1,990

STEEL TUBING

GRADE MT-1010 RANDOM LENGTHS

SEAMLESS HYDRAULIC, ANNEALED

O. D.	Decimal Wall Gauge	Quantity in Feet
1/4"	.035	1,875
5/16"	.035	2,577
3/8"	.035	962
	.049	220
	.065	2,996
1/2"	.049	2,257
	.065	4,342
	.083	4,580
5/8"	.035	4,360
	.049	2,679
	.065	8,438
	.083	2,061
3/4"	.049	912
	.065	1,995
1"	.065	3,613

COLD ROLLED WELDED, FLASH REMOVED

O. D.	Decimal Wall Gauge	Quantity in Feet
1/2"	.035	2,686
	.049	2,182
	.065	5,000
5/8"	.035	2,935
	.049	3,092
	.065	202
3/4"	.035	8,182
	.049	5,658
	.065	6,113
7/8"	.049	3,075
	.065	6,631
	.083	80
1"	.035	5,302
	.049	6,588
	.065	2,466
	.083	2,896
1-1/8"	.049	652
1-1/4"	.035	2,748
	.065	736
	.083	2,578
1-3/8"	.035	838
1-1/2"	.049	3,435
	.065	3,721
	.083	5,417
2"	.049	3,257
	.065	3,428
	.083	2,968
2-1/8"	.083	747
2-1/2"	.065	2,991

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Dallas 9, Texas
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Sam D. Hodgdon
Phone: Elmhurst 3271

Tulsa 3, Oklahoma
302 North Boston
Scott J. Harrison
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Neal Dahn
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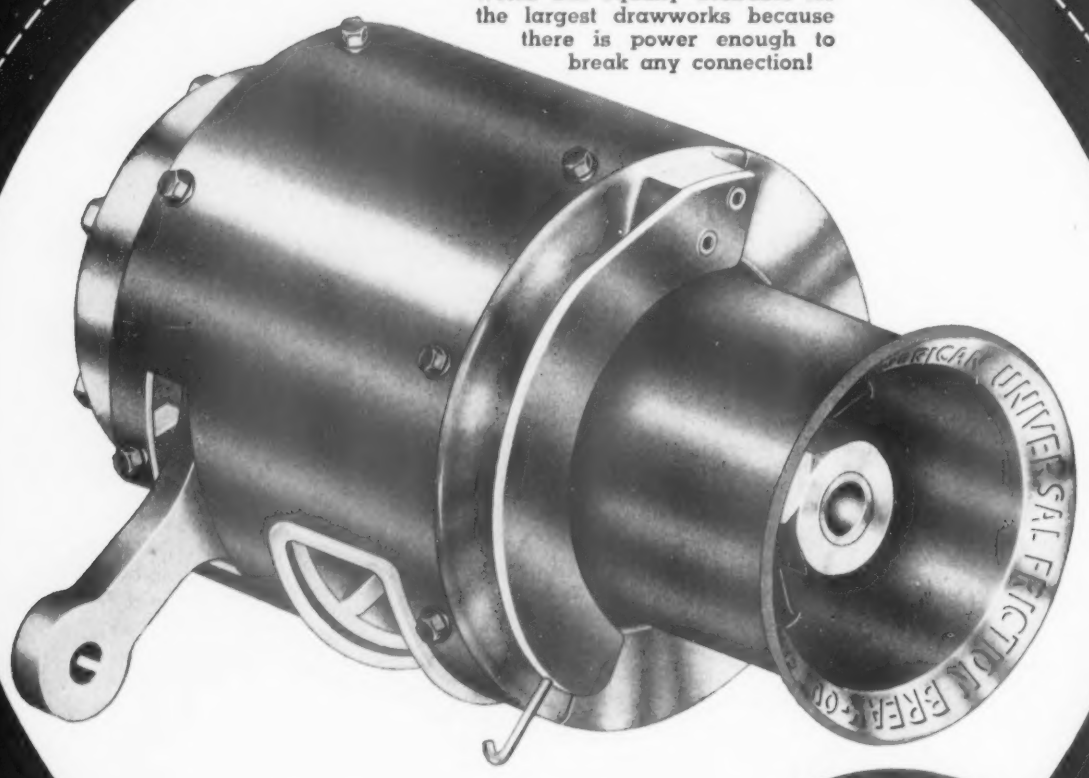
American Iron "UNIVERSAL" Makeup and Breakout Catheads

Easily installed on small drawworks but equally desirable for the largest drawworks because there is power enough to break any connection!



With "Universal" Catheads, the line pull is closer to the shaft bearing . . . there is instantaneous engagement and release . . . there are no sensitive toggles to get out of adjustment!

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Reef Fields Plants

houses located near the facilities. Fifteen of these are located at the plant in East Vealmoor field and one house is located at the product storage terminal and at each of the compressor stations in Good, Vealmoor, and Reinecke fields.

The East Vealmoor gasoline plant office is located at the product storage terminal. Offices for the plant superintendent, the product-storage terminal foreman, and all accounting personnel are located here.

Communication . . . Due to the widespread nature of operations and the lack of available communication, a relatively elaborate shortwave-radio system has been installed to facilitate operations. This includes five base stations, located at the plant, the general office at the storage terminal, and at each of the compressor stations in Good, Vealmoor, and Reinecke fields.

By this means the receiver may be located in the house of the compressor station operator so that he can be reached at all hours during the day without the necessity of listening to the usual radio traffic. A call indicator signal light also informs the operator if any calls were directed to his station while he was absent. Although the base units at the plant and at the product storage terminal are located in the offices, remote-control units are installed in the plant control room and in the product storage terminal laboratory so that the operators can use this means of communication without leaving the operating area.

Although the East Vealmoor gasoline plant is now processing all casinghead gas from five oil fields, additional gas-gathering and compressing facilities for a sixth field are now being installed. These facilities will handle casing-head gas produced from South Von Roeder field, which is located about 3 miles northeast of Reinecke field. To facilitate operations, the additional compressor facilities will be located at the Reinecke field compressor station and the gas-gathering system will be extended from that location to the leases in South Von Roeder field. This extension will add approximately 7 miles of 6 and 8-in. pipe to the plant gas-gathering system.

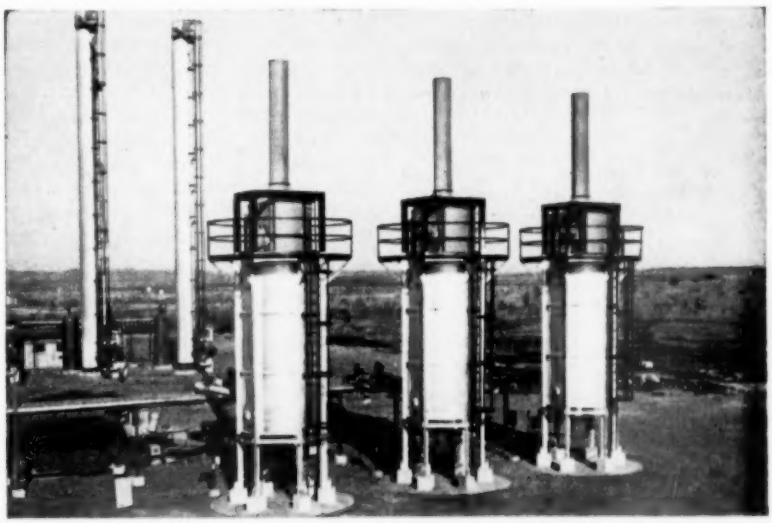
J. R. Butler is president of Reef Fields Gasoline Corp., and M. R. Lents is vice president and general manager. Charles Sweeney is superintendent of the East Vealmoor gasoline plant, Jim H. Zike is assistant superintendent and James Foster is chief engineer. The office manager is Kenneth Huff.

FOR

Rich Oil Heating for Gasoline Plant Service—Indirect Heating for Grease Kettles—Steam Superheating—High Temperature Gas Heating—Dehydration Equipment—Petrochemicals—Asphalt Heating

Struthers Wells

FIRED HEATERS



The three Struthers Wells direct fired heaters illustrated are in use at a West Texas gasoline plant. Each has a capacity of 6,000,000 Btu per hour, at high thermal efficiency.

In applications listed above where indirect heating is utilized, the circulating medium may be Dowtherm or oil. Dowtherm may be used in vapor or liquid phase.

Heating systems may be supplied complete with all instruments, controls and burners. High thermal efficiencies may be secured, if desired, using finned tube convection surface.

Heaters to about 10,000,000 Btu may be shipped completely assembled and ready for field erection, except for structural platforms and stacks. Larger units are field assembled, but require a relatively small amount of labor.

Quick deliveries are available in an extensive line of standard sizes.

Struthers Wells

Write for Cat. C-45 on your letterhead, please.

STRUTHERS WELLS CORPORATION
WARREN, PA.
Plants at Warren and Titusville, Pa.
Representatives in Principal Cities

A.A.O.D.C. TECHNICAL REPORT:

How Modern Drilling Muds Affect ... In West Texas-New Mex.

by J. S. Bell

Henry Black & Sons Drilling Co., Midland, Tex.

A PRINCIPAL factor in the rate of penetration of the present day rock bit is the character of the drilling fluid in use. Some of the common types in use, and listed in the order of their importance to the rate of penetration are:

1. Water.
2. Air and Gas.
3. Oil Emulsion Muds.
4. Colloidal Clays (Bentonites, etc.).
5. Heavily weighted muds (Barytes, etc.).

The many and diversified jobs that mud plays in the drilling process, necessitates numerous combinations of the various types and grades to accomplish the job required of the fluid column. Since the ratio of feet of hole drilled to hours rotated is directly responsible for the final figures in the profit and loss column, the subject of drilling fluid and its attendant effect upon the rate of penetration is of prime importance.

"Cost per foot" is related in these factors in this manner:

$$\frac{\text{(Rig Cost Per Hour)} \times \text{(Trip Hours + Rotating Hours)} + \text{(Bit Cost)}}{\text{Bit Footage}}$$

From this formula it becomes evident that footage obtained from any drill bit has a direct bearing on whether your rig is making money, or losing money. Furthermore, as a general statement it may be said that any time a bit achieves 100 ft. or more of drilling, the rate of return for that bit under present drilling costs is satisfactory. When a bit achieves less than 100 ft. of drilling, it may be assumed that we are obtaining unsatisfactory returns from our operations and should begin to cast about for some means of expediting the penetrating rate.

The drilling fluid in use definitely affects this ratio. We should, therefore, take a good look at this vital segment of the drilling procedure. The improper selection of these fluids may overcome whatever good has been accomplished in improved drilling technique.

The flow qualities of water and air (or gas) make them ideal in the process of drilling both from the standpoint of cooling, low hole-formation-pressure differentials, cost and flowing characteristics. It is common knowledge that we as contractors would ordinarily prefer this type of carrier from the grass roots down. These fluids, or carriers, however, though excellent for exacting a high rate of penetration from a drill bit, cannot always fulfill other requirements of a drilling fluid column.

Requirements . . . The following factors, besides cooling, must also enter into the selection of the drilling fluid:

1. Ability to remove cuttings.
2. Ability to prevent caving by:
(a) Provide hydrostatic differential pressure sufficient to hold loosely consolidated formation in place.
(b) Consolidate loose or caving formation in a gelled mud.
(c) Check the intrusion of waters in the drilling fluid into the formation.
3. Control gas, oil or water in the formation.
4. Lubricate drill pipe, collars, bit and entire mud system.
5. Inhibit corrosion.
6. Hold solids in suspension.
7. Bring cuttings to surface and deposit when and where needed.

All of the above elements or characteristics must at some time during the drilling operations be taken into account.

As was stated previously, the type of drilling fluid has a direct bearing on the rate of penetration, and instructions to **mud up** have caused many a drilling superintendent or contractor to take another look at his hole card.

Example at Pegasus, West Texas

I would like at this time to attempt to throw a little brighter light on this picture in those instances where it is necessary to mud up for various reasons and where permission of the operator can be obtained. The use of oil in mud, or mud in oil (but we will discuss this as the former) has been found in many cases to be of great importance to the rate of penetration in West Texas and New Mexico. For instance, a typical example occurred in the Pegasus field in West Texas:

Two wells were carried to 9,300 ft. with clear water and an adjoining well with a medium viscosity mud. Those drilled with water reached this depth several days quicker than the mudded well. All three were carried with mud to 10,500 ft. at approximately the same time. At 10,500 ft. the well which had been mudded all the way was converted to an oil emulsion mud, and was then carried to total depth of 11,200 ft. This rig consumed 240 hours drilling from 9,500 to 10,500 ft., but only 90 hours from 10,500 ft. to total depth. The two rigs using mud took approximately 160 hours to dig this same footage (see Fig. 1).

Example at Lovington, N. M.

To carry further this subject of the value of oil, emulsion mud, in the Lovington area of Southeast New Mexico, the following records for comparison were established by one of our contractors:

	Bits	Size (in.),	Footage drilled	Rotating hours
Well A*	151	7⅞	3,610 to 11,230	1,235½
Well B*	151	7⅞	3,615 to 11,283	1,315
Well C†	88	7⅞	3,610 to 11,302	860
Well D†	72	7⅞	3,655 to 10,834	668

*Both wells were drilled with conventional chemical mud and conventional bits, and both mudded up at 7,000 ft. †Both wells drilled with jet bits and oil emulsion mud; mudded at 7,000 ft.

To show that all of the increase in rate of penetration could not be laid to the use of jet bits, one other well

Rate of Penetration in Oil Drilling...

was drilled between the first two and the last two, and using jet bits but conventional chemical mud. The record it established is this:

	Bits	Size (in.)	Footage drilled	Rotating hours
Well E	106	7⅞	3,585 to 11,228	1,030¼

Comparing the above figures it is apparent that the use of jet bits was probably responsible for approximately 50 per cent of the decrease in rotating hours, and oil-emulsion mud the other 50 per cent.

I will not attempt to take up in detail the subject of oil emulsion mud, as it is a subject of wide potentialities, and should, no doubt, be given much study and attention by the drilling contractor. I will, however, call to your attention the following points of interest in its use:

1. In practically all cases where records have been kept on its use, economies have been affected in the rate of penetration.

2. A definite increase in the life of the bit has been generally accomplished.

3. Bore-hole conditions are considerably improved and maintained.

4. Mud pumps and systems are more easily and economically maintained.

5. General effect on the mud column is improved by lessening water loss, inhibiting bit balling and improving lubrication.

6. Better completion results obtained.

It has been found generally true, also, that no difficulty is encountered in geologic interpretations, except in some cases of wall sampling.

A report in detail on this subject by a committee headed by H. W. Perkins, Sun Oil Co., for the A.P.I. is available, and I heartily recommend it for your information.

To return to the effects of the drilling mud on the rate of penetration, I would like to state an elemental principle—**"the flow of the drilling fluid across the bottom of the bore hole is the same as that flow within the pipe or across a flat surface."**

Those flow types are of two classifications—**laminar** and **turbulent.** The proper understanding and use of these two types of flow are very important to rate of penetration.

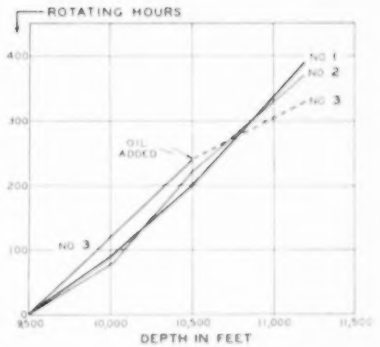
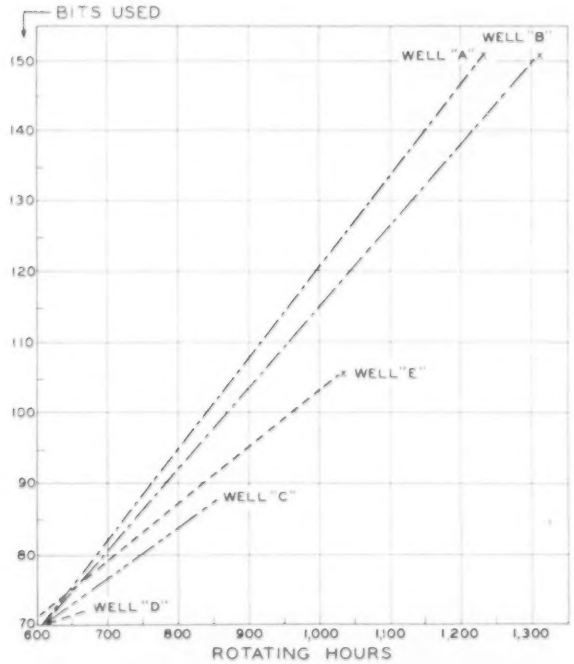


Fig. 1—Comparison of drilling times for West Texas wells when using water (Nos. 1 and 2) and when using oil-emulsion mud (No. 3).

Laminar flow may be classified as straight or streamline. This flow occurs at low velocities in any type of fluid. As flow rate is increased, we approach the rate which we call turbulent, and this rate is directly governed by the viscosity. Also, the velocity of the fluid always ranges from zero at the wall of the pipe or the surface of the hole to a maximum at the center of the fluid column.

When turbulence is reached, all particles except those extremely near or at the pipe surface tend to move in many directions, while still maintaining their flow velocity. Adjacent to the wall of the pipe or hole is a thick or thin coating with zero velocity. The thickness of this coating is directly



Comparison of drilling rates, times, and depths using conventional muds and bits and oil-emulsion mud and jet bits.

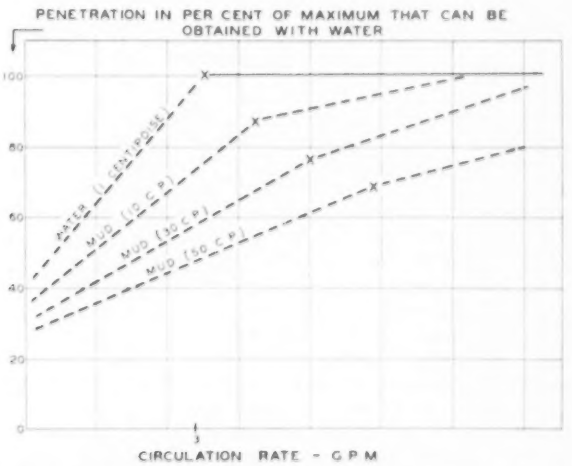


Fig. 2—Relationship of mud properties to fluid velocities and rates of penetration.

governed by viscosity, yield strength and velocity of the mud stream.

The action of the drilling fluid stream as it is propelled through the drill stem tends to act in a like manner on the bottom of the bore hole, and removal of the cuttings in front of the bit are dependent on the ability of this fluid to loosen, dissolve and carry off in suspension.

Through devious means I was fortunate enough to obtain some results of partially completed laboratory tests being now carried on by one of our major companies. Fig. 2 reflects in approximate form the relationship of mud properties, fluid velocities, and rate of penetration. Please understand that these results were obtained in a laboratory experiment, using various types of muds, and circulated at various velocities, but weight on the miniature bit and revolutions per minute were held at constant speed. The following conclusions may be drawn:

1. With a static velocity of flow, increasing the fluids viscosity and yield definitely lowers rate of penetration.

2. Given sufficient velocity, the penetration rate using any drilling mud can approach that obtained by the use of water.

Under conditions of these tests, and while using water as the fluid, the minimum efficient rate at which all cuttings were carried upward in the stream was 3 g.p.m. Increasing the velocity did not seem to increase the penetration rate. But, when using a drilling fluid, or mud, in this same experiment, a higher rate of circulation than that needed merely to carry off the cuttings did increase the rate of penetration. The reason for this difference in action appears to stem from the effect of a turbulent mud stream on the cuttings. The low viscosity carrier, such as water, readily seeps (or rushes) under the cuttings, thus loosening them and allowing the flow above to pull or suck the cuttings into suspension.

The higher viscosity of the mudded fluid inhibits this seeping or loosening characteristic, so must accomplish the same purpose by high turbulence, this decreases the thickness of the wall or floor cake, and pulls loose the cuttings by a suction or shock process.

You who are familiar with the action of jet bits will recognize this principle in action. Jet bits impinge the high velocity of the stream of mud directly on the formation at the bottom of the hole, while conventional bit flow is directed at the roller cones. This stream must be so characterized as to remove both small and large cuttings at the earliest possible time to avoid unnecessary wear of the bit. Note this: Viscosity and yield strength of your mud increases enormously from either characteristic, the velocity required to accomplish turbulence, and the necessity for turbulence in flow is directly in proportion to these properties.

Another phase of this vital study is the effect of pressure differential on the rate of penetration. Tests were made using both a clear water and a low viscosity or low solids mud. A test with a mud containing a higher degree of solids would have shown even more contrast. These tests indicated that the use of clear water, and probably air, did not affect the drilling performance by the application of hole-formation pressure differential across the surface of the bore hole. This did not hold true when a mud fluid was used and a hole-formation pressure differential exerted. The reason for this is apparently as described above. Water penetrates below the cuttings, causing them to loosen from solution and to be washed loose. Mud, of sufficient solid content to prohibit this infusion, does not perform the same function, but, instead, tends to hold cuttings in place from above with this same pressure.

Experiments show that the hardness of certain rocks tend to increase or decrease by increasing or decreasing the surrounding pressure to which they are subjected. This increase in hardness from external pressure varies, of course, as the original hardness of the formation or rock. Eg. chert, quartzite, granite, show much less increase in hardness from those pressure differentials, as you would expect, and limestone, shales, and sandstones show more.

For examples, in tests using the latter or softer type of rocks, a pressure 4,000 to 5,000 psi. will increase the hardness two to three times. Further tests showed that this increase in hardness or density definitely affected the rate of penetration in that it changes entirely the reaction to the bit action and the action of the drilling fluid. Formations that have a tendency to chip at atmospheric pressure, failed entirely to crack or chip when subjected to this higher pressure exerted at the bottom of the hole, and instead, merely extruded up around the teeth of the bit, and sometimes not even this.

From these results we can clearly determine that a high pressure exerted to move a highly viscous column of fluid through the mud system at a velocity sufficient to cause turbulence, tends to defeat its purposes by setting up just such a hole-formation pressure differential as was mentioned above.

. . . "Modern Muds Affect . . . In Ark-La-Tex Areas

by R. W. Waddell

Delta Drilling Co.
Tyler, Tex.

THERE is a very definite relationship between drilling fluids and the rate of penetration in oilwell drilling. This statement might be applicable to practically any part of the world, but is based primarily upon the findings garnered from well records of a very representative group of drilling contractors operating in the Ark-La-Tex area.

Most of us who have been around a drilling rig at the time a mud engineer makes his appearance preparatory to making changes in the drilling mud program, have heard the toolpusher or driller say, "Our drilling days are over, we won't be able to make any hole when he gets through." Even though we might scoff at this statement there might be more truth in it than we think. There is no better "drilling" fluid than water, and, as solid suspending materials and solids are introduced into this water its fluidity is proportionately reduced which in turn retards fluid velocity at the bit nozzles and slows down the dissolving and washing effect on the shale cuttings around the bit. It is generally conceded that a cleanly washed bit will drill better than a balled one.

Drilling in the Ark-La-Tex area is very similar throughout, with the exception that there are some variations of depths where the different formations are encountered. Drilling fluids with the proper characteristics are very necessary for the protection of the upper parts of the hole, especially if short strings of protective casing are contemplated. Short strings of protective casing are those which leave unprotected such formations as shales that

Drilling Rates"...

are likely to heave, swell or slough; very porous sands with rapid filtration rates that are likely to cause thick wall cake deposits; and in many instances will leave exposed fractious or porous zones which are very likely to result in what is termed, loss of circulation. In fact, it has been known that, had just one more joint of casing been set several days of drilling time would have been saved.

Longer strings of protective casing, those which extend through the before mentioned troublesome formations, practically eliminate upper hole hazard potentiality. Of course, there is always present the possibility of having the same troubles while drilling down to these deeper points, but, as a general rule, this part of the well is drilled at a rapid rate with a very fluid mud and the casing is set before the hazards present have time to develop.

All drilling contractors operating in the Ark-La-Tex area are aware of the fact that the first 5,000 ft., more or less, must be drilled at as rapid a rate as possible or else the margin of profit, if any, will be very narrow. Thus, it can be seen that the amount of protective casing and the type of drilling fluid must be given great consideration when the drilling of a particular well is contemplated.

These previous statements are not intended to minimize the importance of thoughtful study and maintenance of good and proper drilling fluids. Colloidal chemists, both those working in conjunction with the mud companies and the oil industry have, in the past 10 or 15 years, developed products and techniques which have assisted in drilling wells to depths which, without them, would have practically been impossible to attain. But, it is intended to ascertain that drilling fluids of various types can be detrimental as well as beneficial to the drilling contractor.

Several very representative well records are going to be introduced as evidence that certain types of drilling fluids do have a very definite bearing upon the rate of penetration. These examples have not been chosen because of very exceptional differences, but have been chosen and grouped as such, because of their similarity as to areas and drilling practices. For obvious reasons the drilling contractors that drilled these wells will be listed as A, B, C, etc., the wells will be numbered and the general locality will be given. If any requests for further information are received, the inquirer will be furnished the identity of the particular contractor in question.

In considering wells 1 and 2, which were drilled in the same field with essentially the same drilling methods employed, it is natural to assume that the types of drilling fluids used were a great contributing factor toward the difference in the rate of penetration.

Wells 3 and 4 were drilled under very similar conditions with the exception of differences in sizes of holes. The mud characteristics were practically identical although the types of chemicals used were different. In consider-

(Continued on page 146)

TABLE 1*—WELLS 1 AND 2 DRILLED IN NORTH CENTRAL LOUISIANA; WELLS 3 AND 4 DRILLED IN SOUTH ARKANSAS

	Well 1	Well 2	Well 3	Well 4
Mud:	Lignin-Lime	Lignin-Lime	Caustic-Queb.	Lignin-Lime
Interval:	3,700-4,700 ft.			
Mud:	Oil emulsion	Bentonite	Bentonite	Bentonite
Interval:	4,700-8,500 ft.			
Depth, ft.	8,500	8,500	9,000	9,000
Hole, in.	8¾	8¾	9	9⅞
No. bits	67	64	51	63
Mud wt., lb.	Max. 11	Max. 11.2	Max. 10.7	Max. 11
Mud vis.	Max. 50	Max. 50	Max. 47	Max. 48
Mud W.L., cc.	17 to 12	16 to 7	20 to 9	17 to 7
Drill days	55	66	47	64

*Contractor A furnished above records.

TABLE 2* — RECORDS OF FOUR WELLS DRILLED BY CONTRACTOR B IN A NORTHEAST LOUISIANA FIELD

	Well 1 Caustic-Queb. Bentonite—	Well 2 Caustic-Queb. Bentonite—	Well 3 Lime-Lignin Bentonite—	Well 4 Caustic-Queb. Bentonite—
Mud type—	CMC	CMC	starch	CMC
Depth, ft.	8,000	8,000	8,000	8,000
Size hole, in.	8¾	8¾	9	8¾
Protective casing	1,200'—10¾"	2,406'—10¾"	3,786'—10¾"	1,077'—10¾"
Bits to 9,000 ft.	52	71	81	60
Mud wt., lb.	Max. 10.8	Max. 11.2	Max. 11	Max. 11
Mud vis.	Max. 45	Max. 48	Max. 43	Max. 45
Mud W.L., cc.	20 to 8	15 to 6.6	15 to 3	17 to 6.8
Drill days	35	34	49	41

*Since there was considerable coring and testing below 8,000 ft., the records apply only from surface to that depth.

TABLE 3*—THESE THREE WELLS WERE DRILLED IN NORTHEAST LOUISIANA BY CONTRACTOR C

Mud type—	Caustic-Queb., Bentonite-CMC		
	Well 1	Well 2	Well 3
Depth, ft.	10,710	10,810	10,660
Size hole, in.	8¾	8¾	8¾
Protective casing, ft.	2,113	5,478	5,453
Mud wt., lb.	Max. 11.8	Max. 11.6	Max. 12
Mud vis., cp.	36 to 66	34 to 65	35 to 65
Mud W.L., cc.	25 to 8	40 to 8.2	45 to 8.5
Net drill days	86.85	71.25	66.21

*All drilling under the same supervision and drilled with the same steam rig with substantially the same crews.

TABLE 4*—TWO WELLS DRILLED IN NORTHEAST TEXAS BY CONTRACTOR C USING THE SAME RIG, SUPERVISION, AND CREWS

	Well 1 Caustic-Queb.	Well 2 Caustic-Queb.-Lignin
Mud type—	Bentonite-CMC	Lime-oil-starch-CMC
Depth, ft.	10,040	10,010
Size hole, in.	12¼—8⅝	12¼—8⅝—7⅞
Protective casing, ft.	5,092	5,112
Bits used	6—12¼ in.; 90—8⅝ in.	7—12¼ in.; 29—8⅝ in.; 51—7⅞ in.
Mud wt., lb.	Max. 11.8	Max. 12
Mud vis., cp.	35 to 70	36 to 65
Mud W.L., cc.	17 to 7.8	18 to 1.5
Net drill days	71.9	87.2
Net time on bottom	54.1	65
Cu. ft. hole	6,177	6,032
Total mud cost	$22,000	$40,000

*The two wells were direct offsets in Northeast Texas, but were owned by different operators and were drilled to a depth just below 13,000 ft. In the table, records are shown to 10,000 ft. only, due to the fact that coring was done essentially from 10,000 to 13,000 ft.

VALVE FAILURE due to thermal and hydraulic shock.

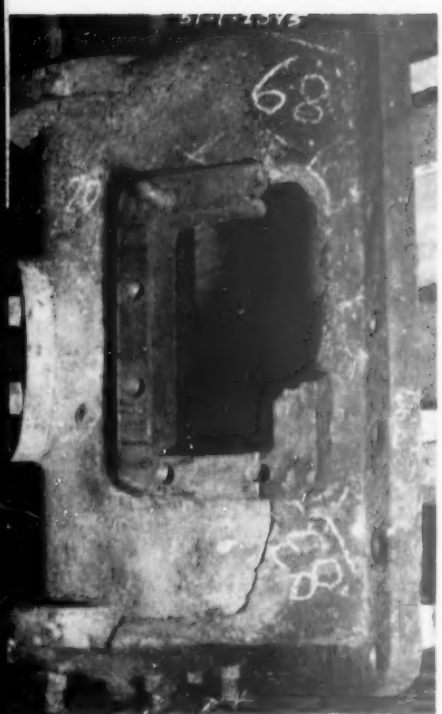
CAST-IRON FAILURE which resulted in fire.

When Can You Use Cast Iron

. . . in the refinery?

Low tensile strength and brittle nature of this metal limit its use in the modern refinery but it is quite satisfactory for some applications

by W. J. Buxton



RECIPROCATING PUMP head failure.

WHILE use of cast iron in the modern refinery is limited by its rather low tensile strength and its brittle nature, it can be used economically in many applications such as:

- Cooler coils for noncorrosive oil streams.
- Pumps for heavier petroleum fractions where service pressures and temperatures do not exceed 250 psia. and 250° F.
- In certain distillation column applications.
- Channels, floating head covers, and bonnets for certain heat exchangers.

Use of cast iron should be prohibited inside process-unit limits for all hydrocarbon and hazardous chemical service and for superheated steam service. Cast-iron compressor parts which fail in service should in most cases be replaced with steel parts.

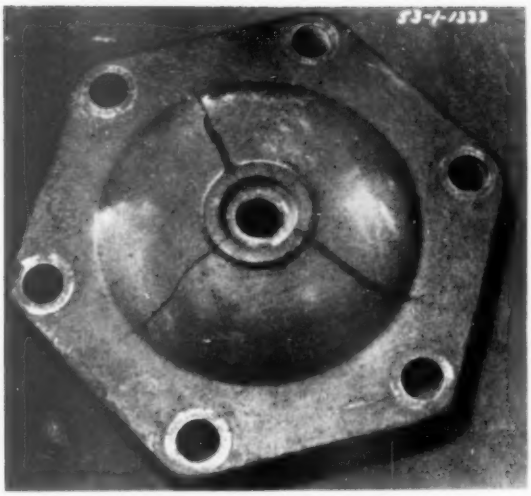
Author is with the engineering division, Standard Oil Co. (Ind.), Whiting, Ind. Paper presented at the petroleum mechanical engineering conference of the American Society of Mechanical Engineers, Houston, September 28-30, 1953.

Physical Properties of Cast Iron and Steel

A comparison of the physical properties of steel and cast iron provides an indication of the proper use of cast iron.

In its usual form cast iron is an alloy of iron, carbon, and silicon in which more carbon is present than can be combined with the iron to form iron carbides. Therefore, part of the carbon exists as free graphite in the form of flakes. The ultimate tensile strength of most commercial cast iron ranges from 20,000 to 40,000 psi. It has no definite yield point so the offset method is used to arrive at a pseudo yield point. The hardness of gray cast iron ranges from 100 to 140 Brinell although it can be heat treated to a hardness of about 600 Brinell. The ductility of most cast irons is virtually zero.

It may be mentioned here that a new type of cast iron has recently been developed. This so-called "ductile" cast iron, because of its differences from gray cast iron in internal structure, possesses nearly as much ductility as steel. The use of "ductile" cast iron for refinery applications appears promising,



COMPRESSOR VALVE cover-plate failure.

GAS-COMPRESSOR piston failure.

particularly if it can be produced for costs intermediate to cast iron and steel.

Composition . . . Carbon steel, like cast iron, is an alloy of iron and carbon, but usually contains only 1 per cent or less carbon. Small amounts of manganese, silicon, phosphorous and sulfur are normally found in steels. The carbon is entirely contained in compound form, iron carbide, and it is the phase changes of this compound that makes possible the heat treatment of steels. The tensile strength of carbon steel ranges from 50,000 psi. to more than 80,000 psi., depending on its carbon content and heat treatment, and the yield strength is usually from 50 to 60 per cent of the tensile strength.

Ductility of carbon steels, as measured by elongation under load, is of the order of 25 to 35 per cent while hardness ranges from 100 Brinell for low-carbon steel to more than 700 Brinell for high (more than 0.80 per cent carbon) carbon steel. Alloy steels are used in the refinery where extended resistance to corrosion is required or when high operating temperatures are contemplated. The physical properties of alloy steel are similar to those of plain carbon steel.

The primary differences between the physical properties of cast iron and steel are: (1) carbon steel is about as strong in tension as it is in compression while cast iron is about one-third as strong in tension as in compression, (2) carbon steel is usually quite ductile while cast iron has practically no ductility, and (3) carbon steel is elastic and tough while cast iron is brittle.

Limitations on Use of Cast Iron

Preferably, cast iron should be used where it can be loaded statically in compression. In certain applications it can serve as a tension member and as a member subjected to impact or varying loads; however, the bulk of cast iron required to resist such loads safely is considerably more than would be the bulk of steel.

These general concepts of the load-carrying capacity of cast iron are certainly fundamental, but they should not be considered rigid rules since, as has been mentioned, cast iron has been successfully used for almost every service in the refinery. But experience has indicated that the physical weaknesses of the material should dictate limitations on its use from both a cost and safety standpoint. Examples of the use of cast iron in services where its structural weaknesses have led to failures are given in the following paragraphs.

Service failures . . . Numerous failures have occurred where cast-iron valves and pumps were installed in long runs of piping subject to rapid stream shut-off. Loading-rack lines are an example of this type of piping. Similarly, contractive forces induced in long runs of piping by temperature drops have also caused failure of cast-iron valves and fittings.

It has been estimated that a 50° F. temperature drop in a straight run of restrained pipe could cause failure of the flanges of a cast-iron valve installed in the line. The comparatively small number of such failures is probably due to the fact that the serious effects of contraction are usually eliminated by the use of pipe bends or elbows in the layout.

Another example of cast-iron failures are valve cover plates on reciprocating compressors. The plates are loaded by a screw through their center, which holds a valve in place, and the varying bending stresses induced in the plates quite often result in radial cracks being formed outward from the center hole. Heads of reciprocating pumps, valve plates on reciprocating pumps, and many other flat, edged restrained cast-iron members have similarly failed.

Occasionally equipment is built or installed so that bearing edges of cast-iron members are subject to eccentric loadings. The bolting of flat-faced cast-iron flanges to raised-face steel flanges or the use of ring gaskets with flat-faced flanges is an illustration of this problem, although this rarely occurs now because most engineers and pipe fitters are aware of the results. It is common practice to remove the raised face of the steel flange so that a full, flat-faced joint is obtained. However, we still find that some internal cast-iron pump parts, for example, are sometimes loaded in this fashion and failures occur. Such failures are especially unfortunate since no satisfactory welding repair can be effected.

Potential costs . . . The potential costs and hazards which may be associated with the type of cast-iron failures previously mentioned are very difficult to evaluate. The failure of a cast-iron valve in relatively moderate service, as far as pressure and temperature are concerned, can result in very extensive fire damage if the valve is located within process-plant boundaries (or other relatively congested areas) and a flash and fire result.

Accidental breakage and nonrepairability are the two items which contribute most to maintenance costs of cast-iron parts. Accidental breakage is generally caused by personnel, unfamiliar with the rather brittle nature of cast iron, who attempt to handle cast-iron parts as they would steel parts.

For example, we have found that pipe fitters installing cast-iron valves must be especially cautioned. Another cause of breakage which can be very serious is the sudden chilling of cast-iron equipment by fire streams under fire conditions.

The nonrepairability of cast iron is sometimes a factor in the service life of equipment such as water pumps because the casings of these pumps are often eroded by a slight amount of entrained solids. A steel pump casing could be repaired in place by welding, but the repair of the cast iron casing would involve considerable expense to obtain a repair of questionable value. The failure of parts of other cast-iron refinery equipment often leads to the expensive replacement of the entire equipment component since a brazed or welded cast-iron repair is usually not at all satisfactory.

Rules for Use of Cast Iron

Until the competitive position of steel relative to cast iron improves, cast iron has a place in certain services provided its limitations are fully recognized. In general, cast-iron equipment can be regarded as acceptable for relatively low-pressure and low-temperature service, in nonhazardous and nonshock service, and in services where the over-all incremental cost of similar steel equipment is judged to outweigh the likelihood of failure and resulting damage in the area involved. Tentative rules or guides, generally in keeping with this point of view and used to a considerable extent by the Whiting refinery, are described below.

Cast-iron centrifugal-pump casings are commonly used where discharge pressures do not exceed 250 psia. and where operating temperatures are between —20° and 250° F. In this range for hydrocarbon service the vapor pressure should be less than 8 psia. at 100° F. (or at the pumping temperature). In addition, equipment with cast-iron casings should be used only in nonshock service and primarily outside refining-unit limits, particularly for hydrocarbon service. Internal pump parts such as glands and stuffing boxes can also be of cast iron.

Approximately these same pressure and temperature limits are set for the use of cast-iron centrifugal pumps in water service. In general, cast-iron reciprocating pumps may be used in services similar to those outlined for centrifugal cast-iron pumps. As an added safety measure 250 psi. thicknesses with 125 psi. bolting details are specified for cast-iron flanges. This specification has little effect on cost and is usually accepted by pump manufacturers without objection.

Cast-iron pipe is commonly limited to sewer lines which carry no steam condensate; however, some oil-cooler boxes have been constructed which utilize cast-iron coils. If a cooler-box coil handles moderately corrosive to highly corrosive media the over-all economies to be gained through the use of cast iron are questionable, since the coils must be disassembled rather often for inspection and this operation usually results in the discard of almost as many tubes on account of breakage as from corrosion. Cast-iron return bends used with the coils suffer the same fate.

Low-shock service . . . Cast-iron valves are used in low-pressure (50-psi.) steam, service water, and compressed-air services, and in certain low-pressure and low-temperature nonhazardous hydrocarbon and chemical services. Cast-iron valves should not be used, however, where they may be subject to hydraulic or thermal shock. The initial cost differential between cast iron and steel valves makes the use of cast iron attractive in the above-mentioned services. This is the case even though it is well recognized that maintenance and installation (breakage) costs of individual cast-iron valves may cause their over-all cost to be greater than that of a corresponding steel valve.

Some lines of low-priced steel valves are being offered and further development in this direction should be encouraged. It is important to note here that cast-iron valves are currently not specified for new i.s.b.l. (inside battery limits) hydrocarbon services. Cast iron valves are installed in nonhazardous locations of o.s.b.l. (outside battery limits) hydrocarbon lines which have services similar to those allowed for cast-iron pumps.

Cast iron for tubular heat-exchanger parts has been limited to channels or bonnets for some cooler applications but the experience record has not been good. In general, it is felt that process stream coolers should be of all-steel construction with the possible exception, in some cases, of lube-oil coolers, and inter and aftercoolers which may contain cast-iron parts. However, on one lube-oil cooler we have had considerable cracking of cast-iron channels, apparently either due to temperature stresses or pipe-expansion stresses.

It is now recognized that steel construction should have been specified originally for this service and steel is being substituted for the cast iron. Another difficulty with the use of cast-iron exchanger parts is that flat-faced joints are not always provided and the flange bolt loads are sometimes excessive, particularly where alloy bolting (normally used for steel exchangers) is inadvertently installed in cast-iron equipment.

Cast-iron parts of pressure vessels are limited to internal nonpressure-bearing parts. Bubble trays, bubble caps, and baffle trays are sometimes furnished of cast iron. In general, such equipment is entirely satisfactory, if clean, mildly corrosive stocks are to be processed. However, it is doubtful that the use of cast-iron trays is economical, from a maintenance standpoint, where trays have to be removed periodically for inspection or cleaning.

The heavy cast-iron tray sections require considerably more shutdown manpower to handle than do pressed-steel trays, and the cast-iron parts are particularly subject to accidental breakage. Practically every tray in towers having cast-iron trays is operated at reduced efficiency because parts of the tray have been broken and cannot be repaired. Of course, an attempt is made to replace such parts prior to unit startups, but time limits on shutdowns and other factors make completely satisfactory repairs difficult to achieve.

Use in compressors . . . Until recently cast iron has been the standard construction material for compressors; however, the increasing use of centrifugal compressors for some services has brought a change in construction materials for the centrifugal machines. While reciprocating compressors are now and will probably continue to be generally furnished of cast iron, some types of centrifugal compressors are being obtained in steel. It is felt that there are definite advantages to the use of steel reciprocating compressors but their cost is usually prohibitive due to pattern costs and casting difficulties, particularly for service conditions which have been well defined in the past and for which standard cast-iron machines are manufactured.

The advantages of steel over cast iron in compressor applications are associated with the relative repairability of the material and their relative strength when subject to pulsating loads; and, regardless of the high cost, replacements for a particular installation (following a failure traceable to the characteristics of cast iron) should be of steel construction if possible.

Steam turbine casings are generally obtained as manufacturer's standards. Cast-iron casings are used in low-pressure turbines (100 to 150 psi.) while high-pressure turbines (400 to 600 psi.) have steel casings. As in pumps, cast-iron flanged connections requiring 125-psi. A.S.A. flanges are specified to have 250-psi. flange thicknesses and flat faces. Experience with cast-iron casings selected in accordance with present practice has been satisfactory,

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probably as a result of the relatively moderate service conditions involved and the care with which the machines are normally operated.

Conclusions

The use of cast iron in the modern refinery is limited by its rather low tensile strength and its brittle nature. In spite of these weaknesses and because it can be produced economically, cast iron will continue to be used for many applications; however, the designer and user should encourage the development of competitive low-priced steel construction if possible and be alert to the possibilities of such improvements as ductile cast iron. For example, there exists a definite need for a steel or perhaps ductile iron valve whose cost would be intermediate to cast-iron and steel valves. The more desirable physical properties of steel or of ductile iron should show a payoff in over-all valve costs, particularly when the cost of damage due to a cast-iron-valve failure is considered.

Cast-iron pipe finds application for use in sewer lines and noncorrosive oil-cooler coils.

Cast-iron pumps are being used for the heavier petroleum fractions where service pressures and temperatures do not exceed 250 psia. and 250° F. Cast-iron reciprocating compressors must generally be used since steel reciprocators are not normally competitive; however, consideration should be given to the use of steel centrifugal compressors which may be competitive for many services.

Cast-iron tower trays and tray parts should not be used in services where frequent cleaning and inspection of the tower is anticipated. Their use in corrosive or dirty service will contribute to increased tower-maintenance costs.

Cast iron as a material of construction for heat exchangers is usually limited to the channels, floating head covers, and bonnets of certain small coolers. Coolers having service conditions similar to those given above for cast-iron pumps could be economically and satisfactorily furnished with cast-iron parts.

Cast-iron valves will no doubt continue to be used for a variety of services although it is believed their use should be prohibited inside process unit limits for all hydrocarbon and hazardous chemical service and for superheated steam service. All bolted joints should have flat facing with full-face gaskets.

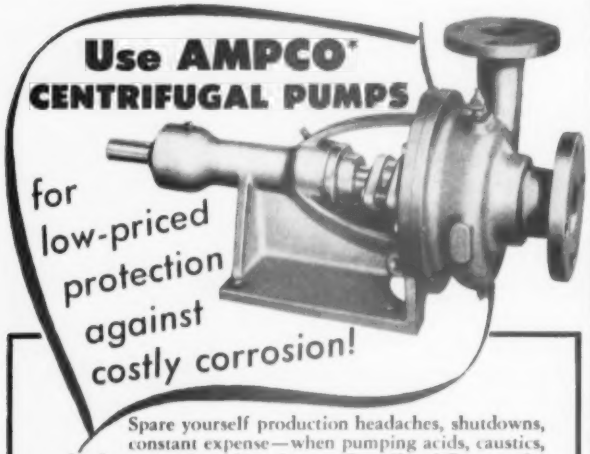
It is believed that the possibility of fire-stream shock under fire conditions and the number of failures of cast-iron equipment including pumps, valves, heat-exchanger channels, and tower-tray parts justify continued effort to limit further the use of cast iron.

Acknowledgment

The author is grateful to his associates in the Whiting refinery engineering division for their comments and help during the preparation of this paper.

Lusty "Sideline"

Many people in the oil business still tend to think of natural gas as a promising but small sideline of the petroleum industry. But economists for the big oil companies paint a different picture. They point out that natural-gas production, on a B.t.u. basis, already has reached a level roughly half of that of the entire petroleum industry itself. And, it is growing at a faster rate. Last year natural-gas production rose 7.5 per cent, petroleum 2.3 per cent. This year the gains are expected to be 10 per cent and 1.5 per cent respectively.



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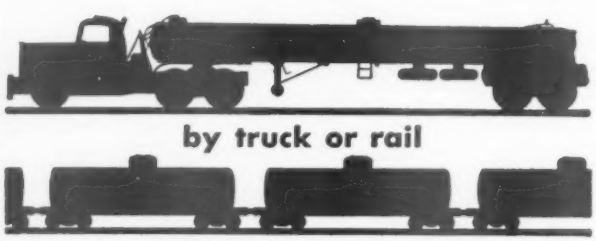

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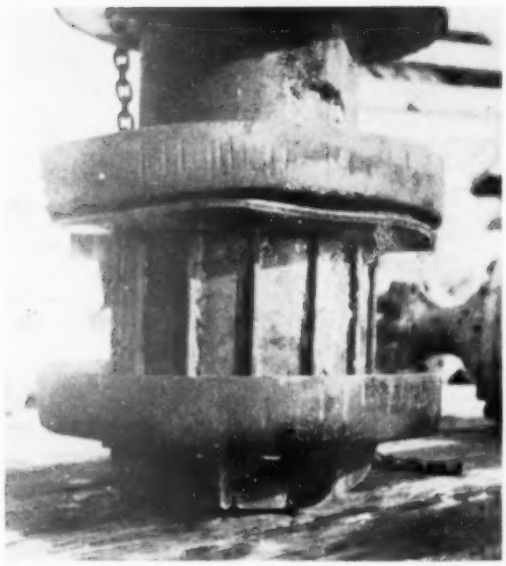
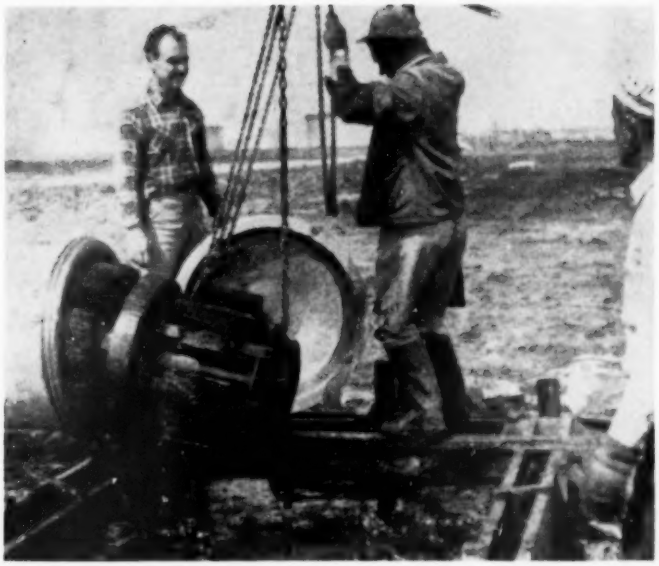


Gaging pig went through the Genoa-Clear Creek section without damage. In traversing the 16-mile Clear Creek-Texas City section as described in Step 2 the gaging plate was bent.



Brush-type scraper being removed from the end of the 26-in. line at Texas City after passing through the Clear Creek-Texas City section as described in Step 3.

Testing of Pan-American's

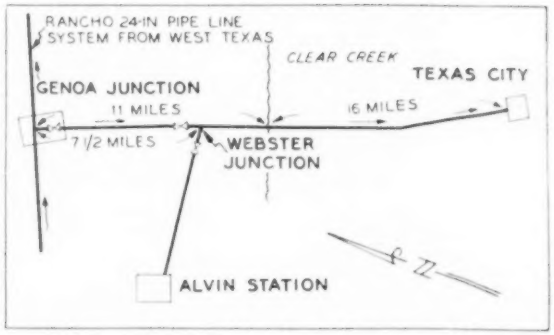


Diagram of facilities involved in testing the Genoa-Texas City line prior to putting it into service for delivering crude oil from the Rancho Pipe Line System.

Genoa-Texas City Line

by Paul Reed
Pipe-Line Editor

IN preparation for initial operation of a new 27-mile, 26-in. trunk line, Pan American Pipe Line Co. ran two types of pigs under four kinds of conditions.

The purpose of the pig program was to insure that the line was full-gage inside diameter without buckling or other obstructions which might interfere with the future running of pigs for routine cleaning operations, to remove any foreign objects or materials, and to brush the inside pipe wall for improved flow efficiency. Any necessity for removing a stuck scraper after the line had been in service would be costly.

The 26-in. line moves crude oil from Genoa Junction on the 24-in. line of the Rancho Pipe Line System to refineries in the Texas City area. The larger diameter of the Pan American line makes it possible to transport from Genoa Junction to Texas City by Rancho delivery pressures without the need of additional Pan Am pumping facilities. Under the conditions it has been recognized as essential that high line efficiency be assured from the start.

The four pig runs, all made with Williamson equipment, may be briefly summarized as follows:

Step 1. After conclusion of successful hydrostatic pressure test, the 11-mile upstream section of the line between Genoa Junction and Clear Creek was traversed by the type LG-3 gaging pig moved by compressed air, which pushed water out of this section of the line.

Step 2. The 16-mile downstream section of the line between Clear Creek and Texas City was traversed by the type LG-3 gaging pig which was pushed by water injected by reciprocating pumps, in preparation for hydrostatic pressure test of this section.

Step 3. The 16-mile downstream section of the line was traversed by a type GP-4 brush scraper pushed by the head of the initial stream of oil pumped during filling operations.

Step 4. Finally, the entire line was brushed with a GP-4 ahead of initial delivery from Rancho.

A more detailed explanation of the above operation follows. The line crosses Clear Creek, a brackish stream, at a point 11 miles southeast of Genoa and 16 miles northwest of Texas City. Clear Creek was the source of water pumped in the line during testing.

Step 1. . . . The Genoa-Clear Creek

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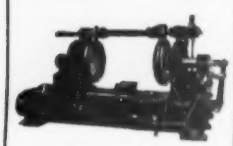

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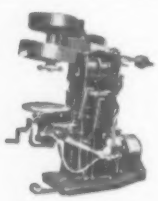

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11-mile section was hydrostatically tested for 24 hours at 800 psig. initial pressure. A steady pressure drop to 720 psig. during the ensuing 24-hour period was attributed to a "spongy" condition due to air entrapped in the line. This condition might have been avoided if a pig could have been run ahead of the water column during initial filling. Inspection disclosed no leaks.

On February 10, 1953, the gaging pig was driven by compressed air from Genoa Junction displacing the water into Clear Creek. The gaging pig came through without a scratch. There were two 500-cu.-ft. per minute compressors on this job which required about 20 hours. During this time, there was only one compressor running for considerable periods. Pressure did not rise above 40 psig. in this test. At the conclusion of the run, the Genoa-Clear Creek 11-mile section was empty and the running of the gaging pig had indicated that the line was of known minimum inside diameter and ready for full capacity service.

Step 2. . . . Water from Clear Creek was pumped behind the gaging pig through the Clear Creek-Texas City 16-mile section. Pumping was done by two piston pumps furnished by the construction contractor.

During the 30 hours required to fill with water, beginning on February 18, pressures averaged 30 to 40 psig., although there were some peaks of 60 and 100 psig.

In running the gaging pig it was felt desirable to use pressures of 50 psig. or less in order to spot the existence of obstructions in the line, which in later routine cleaning operations might retard or damage scraper pigs. The gaging pig was slightly bent on arrival at Texas City. Pressures in excess of 50 psig. were evidently caused either by slight flats in field bends or by other conditions. In one case a line block valve not 100 per cent open, such pressures might have occurred at short-radius shop-fabricated bends, or by a small hand tool inadvertently left in the pipe line which was later removed by running the GP-4 pig (brush scraper) when filling with oil. These pressure surges, however, were of insufficient duration to indicate pipe-line restrictions too close for normal pigging.

Before filling the line with oil, some of the water was drained back into Clear Creek. At the beginning of operations for filling with oil, this section of the line was therefore still partly filled with water.

Step 3. . . . A GP-4 (brush scraper) was inserted at Clear Creek headed toward Texas City and the two sections were tied together. Initial line fill was

pumped into the line at Webster Junction, with the oil moving toward both Genoa Junction and Texas City. The pig effectively displaced the water from Clear Creek to Texas City and eliminated oil-water contamination. Crude oil from nearby Hastings field was used for this original filling of the line. This oil was injected through a line from Pan American's Alvin pump station to Webster Junction, 7½ miles southeast of Genoa.

Step 4. . . . After the operation described in Step 3 above, the entire 26-in. line from Genoa Junction to Texas City was full of Hastings crude. The GP-4 (brush type) scraper was inserted at Genoa Junction and moved through the line from Genoa Junction to Texas City behind the Hastings crude and ahead of the initial delivery of crude oil from Rancho. No foreign material was recovered at Texas City upon removal of the GP-4 scraper following this operation, which would indicate that loose obstructing material had been completely removed by the previous operations.

It might be mentioned that in the Genoa-Texas City line there are six shop-fabricated 26-ft. radius hot bends in ½-in. wall pipe which were necessary in order to stay within right-of-way limits at tight corners.

Lengths of the two stream crossings with ½-in. wall pipe are 671 ft. at Dickinson Bayou and 713 ft. at Clear Creek. Both of these crossings were independently tested at 1,000 psig. and internally gaged. The remainder of the line is 9/32-in. wall pipe.

The gaging pig and brush-type pig runs were effective in determining that the entire line was clean and unobstructed for efficient operation.

BOOK

SUBSURFACE GEOLOGIC CROSS-SECTION FROM MEADE COUNTY TO SMITH COUNTY, KANSAS. By Wallace Lee, University of Kansas Publications, State Geological Survey of Kansas, Oil and Gas Investigations No. 9, Preliminary Cross-Section. Lawrence, Kans.

This cross-section was prepared as a cooperative project between the U. S. Geological Survey and the State Geological Survey of Kansas. Cross-sections already published show the stratigraphic relations of the pre-Cretaceous formations in western Kansas and eastern Colorado. Cross-Section 9 shows the stratigraphic relations of the formations above Arbuckle sequence on a line crossing the Central Kansas uplift from the Salina basin to the Hugoton embayment of the Anadarko basin. An analysis of the structural development of the Central Kansas uplift by means of a series of skeleton cross-sections reveals the several conflicting structural movements that from time to time warped the originally flat beds into the present position.

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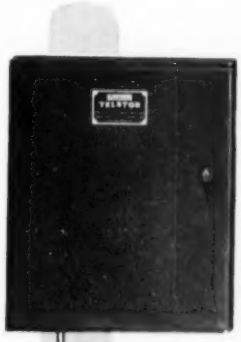

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Cement, Oil, and Surface-Active Agent Form Effective

SQUEEZE-CEMENTING MIXTURE

New mixture gives promise of being able to control unwanted water

by Wayne F. Hower* and Phil Montgomery†

CONVENTIONAL water - cement slurries have been applied with a great deal of success as a means of shutting off water, but their wide usage has definitely pointed to the fact that, in many instances, improvement was needed to increase the efficiency of squeeze cementing. Tests in the laboratory and initial applications in the field have shown that oil-cement slurries, and their modifications, are a step in that direction.

Kerosine or diesel-oil cement slurries are an innovation in the long list of materials and slurries developed for the various uses covered by the general term "squeeze cementing." It is indeed a strange combination of materials, but the mixture does, in many respects, have definite advantages over the conventional water-cement slurries. A recent development has further improved this idea and made the slurry more workable. This improvement is the addition of a surfactant which gives increased dispersion and suspending properties to the oil used to make the slurry.

High density . . . The slurry prepared with the surfactant has a high density, since the use of the chemical permits the addition of twice as much cement in a given volume of oil.

Pumpable slurry weights as high as 16.2 lb. per gal. have been obtained by this means as compared to weights approaching 13.1 lb. per gal. without the surfactant. Thus, when the slurry is squeezed against a formation or into a fracture, a very high ratio of solids to fluid is present, which, when penetrated by the water present in the formation, will give a set material of high compressive strength and very low permeability.

In further analyzing this slurry, it is seen that it is a fluid containing a cementitious material that has an unlimited thickening time. It has permitted the use of portland cement on a squeeze job in South Louisiana in a well 8,800 ft. deep without fear of cementing the tubing. The slurry cannot set until contacted by water and, where a buffer of oil is pumped ahead and behind the diesel-oil cement, a completely independent system is assured. The improved pumping characteristics, developed by the use of the surfactant, makes a readily handled slurry that can be placed with ease and, in like manner, the excess reversed from the tubing after the necessary squeeze pressure has been obtained.

The execution of a job of this type is relatively simple. The surfactant is added to the oil and thoroughly mixed to form a uniform blend. The diesel-oil cement slurry is then prepared with this blend and portland cement in the conventional manner and pumped into the well.

Squeeze techniques . . . Techniques follow past methods very closely in many respects, but a few variations have been noted. Generally speaking, lower squeeze pressures are required with the diesel-oil cement slurries and, in some cases, a smaller volume of cement is displaced. It is thought that a firm placement of the slurry in the desired place is all that is necessary to obtain the desired results. Where squeeze pressures have been difficult to obtain in the past, a slight variation of staging has been employed which has proved to be very successful.

The diesel-oil cement slurry is placed opposite the formation and held in a static condition for a short period of time. The squeeze is then applied with satisfactory pressures and a good job usually obtained. It is thought that the short waiting time permits the slurry to contact water which then forms a slurry of high viscosity at the interface. A better control of the material is then possible when the squeeze is continued.

Water starts to penetrate the slurry as soon as contact is made and continues until the cement has set. Therefore, waiting-on-cement time should be governed by the well-known setting properties of portland cement and has varied between 24 and 72 hours, depending upon the specific conditions of each well. The addition of the surfactant to the slurry causes a more even and thorough penetration of the water and reduces the possibility of oil pockets forming in the set cement.

Certain oil-well conditions prevent the diesel-oil cement slurry from being an absolute method of selectively shutting off water. Wells that are producing great quantities of water or those making smaller quantities and allowed to remain static for a period of time, will have water across the oil-producing part of the formation. Pumping into the well will force additional water into the oil pay thus supplying the water needed to penetrate the squeezed slurry and cause its set.

Although many field applications have shown that a hard cement cap is formed on top, then unset slurry across the oil zone, and again hard cement, it has been found that reperforation was necessary in a majority of the cases to reestablish communication with the formation. The thickness of the set cement against the oil zone has varied and will depend upon individual well conditions, but good results generally have been obtained, even in open-hole completions.

Results . . . Initial results have indicated that the diesel-oil cement slurry can be applied wherever squeeze cementing has been used in the past to shut off water. Particularly encouraging results have been obtained in Kansas where Dakota water has eaten holes in the casing above the pay. Water-base slurries frequently were not satisfactory because squeeze pressures were difficult to obtain and cement was often washed away by the water before it could set. Several jobs with the diesel-oil cement slurry have shown a complete shutoff with only one application.

A well in Oklahoma was fractured in 12 ft. of open hole with the resulting production being 500 bbl. of water and only a show of oil. The formation was squeezed with 100 sacks of the diesel-oil cement slurry with a maximum pressure of 2,000 psi. applied.

After cleaning out, it was open hole perforated with production leveling out at 20 bbl. of oil per day and no water. Another well in Oklahoma was producing 60 bbl. of oil and 40 bbl. of water per day through perforations. The entire formation was squeezed with the diesel-oil cement slurry, cleaned out, and treated with 250 gal. of a

(Continued on page 144)

*Development chemist and ††technical coordinator for cementing services, Halliburton Oil Well Cementing Co., Duncan, Okla.

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Outline of Redwater field showing the 1952-1953 program for salt-water disposal.

Laying pipe in the muskeg of the field area is a problem in that muskeg is underlain by quicksand. If more than 15 minutes elapses between excavation and backfill, quicksand will lift and float pipe out of ditch.

by E. Hochhausen* and I. M. Rice†

CASE STUDY OF WATER-DISPOSAL SYSTEM

Redwater Project Reflects Good Planning

History of Redwater Field

Redwater field was discovered by Imperial Oil Ltd., in the fall of 1948, with the completion of 1 Redwater in LSD 1, 32-57-21. The field is 30 miles northeast of Edmonton, Alta. In size it is about 19 miles long by 3 miles wide.

Redwater was rapidly developed and by fall of 1951 some 900 wells were on production. The bottom-hole pressure at discovery was 1,050 psi. at 1,165 ft. subsea and the wells at first flowed. By spring of 1950 the large volume of fluid removed had caused a decline in bottom-hole pressure so that it was necessary to install mechanical pumping equipment.

Reservoir studies indicated the field had a restricted water drive. Water production was first encountered on the east side of the field, where considerable vertical fracturing is evident. As the reservoir pressure declined and water production increased, the operators in Redwater field foresaw the necessity for returning the salt water to the reservoir—both to assist in maintaining reservoir pressure and to avoid damage to surface water and vegetation.

The Conservation Board set up a system of water penalties whereby oil production from water producing wells was penalized when water production in excess of 2 per cent was not returned to the formation.

IN order to dispose of salt water during the early stages of water production at Redwater, two wells were made available for subsurface disposal to which water was hauled by tank truck. However, large volumes of water soon made this method of gathering water uneconomical.

An investigation was made of participation methods adopted for disposal systems in other areas, such as salt-water - disposal associations and independent corporations. After considerable study, it was decided to form a separate corporation, since no oil operator was willing to accept the responsibility for operating an association, no independent salt-water operator was available at that time and it appeared desirable to have limited liability.

It was therefore the decision of the majority of the operators to form a limited-liability company and this resulted in the incorporation of Redwater Water Disposal Co., Ltd.

*Redwater Water Disposal Co., Ltd., Edmonton, and †Rice Engineering Co., Edmonton. Paper presented at annual general meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, 1953.

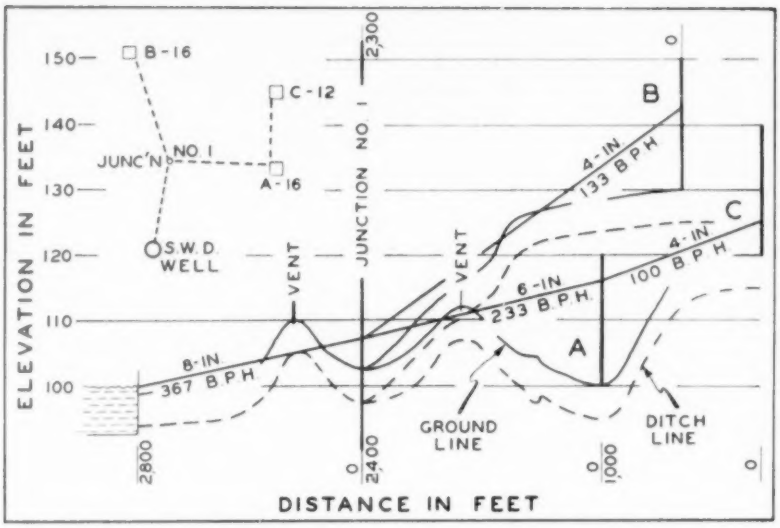
Organization of Project

The disposal company is a joint stock company incorporated under laws of the Province of Alberta. Members subscribe for two shares for each of their producing wells (with exception of Imperial Oil, Ltd., who purchased only 45 per cent of total shares to avoid acquiring a controlling interest).

Shares were issued at $1.00 per share. The shareholdings are important only as a means of determining the voting power of member companies. The company is governed by a board of 11 directors elected by the shareholders.

The disposal company is being financed by the sale of noninterest-bearing debentures to the participating operators. Debentures are purchased on a per well basis as money is required for expansion.

The disposal company levies two monthly charges on participating operators, the depreciation charge and the operating charge. The depreciation charge is levied against all wells in the field. This charge is based on a 10-year amortization of the company's assets and is computed so that the charge



Typical gravity gathering-line installation. Ditch line is kept below hydraulic gradient and high points in line are vented to prevent gas locks. Pipe must be covered at least 4 ft. to prevent freezing of salt water.

Interior of well cellar showing float boat, meter control valve, and connections to well head.

for water-producing wells is twice that for clean oil-producing wells.

The operating charge is levied against water-producing wells. This charge is precalculated quarterly and is divided equally among all water wells tendering water to the system regardless of the amount of water produced from any one well. It is the object of the company to function strictly as a nonprofit organization.

It was the original intention to hire a manager experienced in salt-water disposal, who would acquire a staff to design, construct, and operate the disposal system. However, since little progress was made in this respect and the construction season was getting short, it was subsequently decided to obtain the services of a consulting engineer who would act as temporary manager, and to provide the services of personnel borrowed from participating companies, until such time as a permanent operating organization could be established. During the period of construction in 1952, the borrowed personnel were replaced by permanent employes so that at the end of the construction season a permanent manager and staff were available to operate the system.

The first requirement in installing a gravity system is to obtain elevations of batteries, proposed disposal wells, and predominant topographical features. Information as to the expected maximum quantity of water to be produced from each well must be obtained. After a preliminary design is completed, lines must be located, profiles drawn, hydraulic gradients plotted, and line size and location adjusted to fit terrain conditions. Lines are designed according to the Hazen-Williams equation, using a C factor of 100 which experience has shown is the maximum that can be economically maintained over the life of the field.

Fittings are fabricated from cement-asbestos material and junctions are installed in accessible locations in such a manner as not to disturb the normal direction of flow. Lines are equipped to provide for cleaning with go-devils

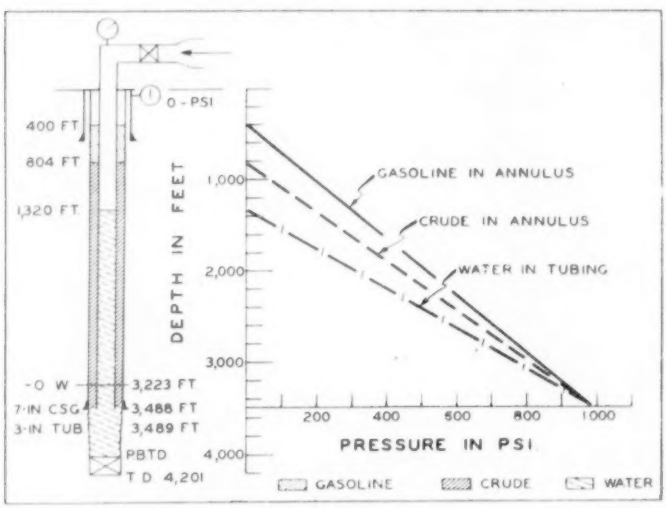
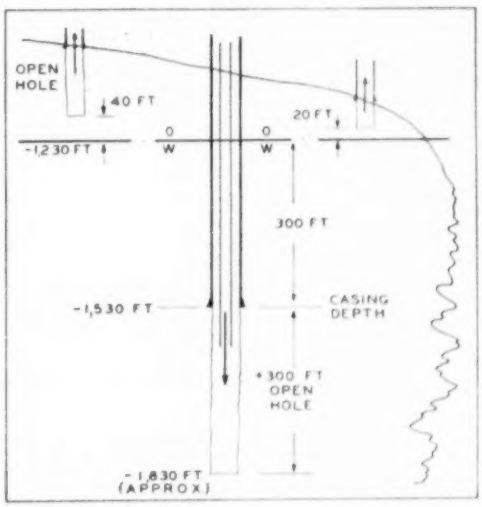


Diagram section of disposal well showing relative fluid levels of salt water (sp. g. 1.07) in tubing and Redwater crude (A.P.I. gravity 35.5°) or No. 3 grade gasoline (A.P.I. gravity 60.5°) in casing. Loading annulus with light gravity oil protects outside of tubing and inside of casing from salt-water corrosion.



Relative depths of completion of oil wells and disposal wells. In some wells there is as much as 600 ft. of open hole below casing point.

IN WELL AFTER WELL... THE JOB: PUMP MORE FLUID

These are actual cases where "Double-Displacement" pumps replaced conventional pumps

EAST TEXAS — MAJOR'S #2

Well Data	2½" TL Pump	2½"x2" Bore "D-D" Pump
Pump Depth	2800'	2800'
Stroke	74"	74"
S. P. M.	20	20
Other Factors	Same	Same
Total Bbl. Fluid	880	1026
Bbl. Water	872	1012
Bbl. Oil	8	14

Total increase: Fluid 16.6%, Oil: 75.0%.

KANSAS — INDEPENDENT'S #2

Well Data	2" Rod Pump	2"x1½" Bore "D-D" Pump
Pump Depth	3420'	1984'
Stroke	54"	54"
S. P. M.	21	17
Other Factors	Same	Same
Total Bbl. Fluid	480	720
Bbl. Water	474	690
Bbl. Oil	6	25

Total increase—Fluid: 50%, Oil: 316%.

GULF COAST — INDEPENDENT'S #3

Well Data	2¼" Bore Common Working Barrel Tubing Pump	2½"x2" Bore "D-D" Pump
Pump Depth	1525'	1525'
Stroke	120"	120"
S. P. M.	12	12
Other Factors	Same	Same
Total Bbl. Fluid	568	883
Bbl. Water	557	860
Bbl. Oil	11	23

Total increase—Fluid: 55.4%, Oil: 109.0%.

ARKANSAS — MAJOR'S #2

Well Data	1¾" Bore Tubing Pump	2"x1½" Bore "D-D" Pump
Pump Depth	3500'	3500'
Stroke	54"	54"
S. P. M.	20	20
Other Factors	Same	Same
Total Bbl. Fluid	237	314
Bbl. Water	221	293
Bbl. Oil	16	21

Total increase—Fluid: 32.4%, Oil: 31.0%.

OKLAHOMA WATER FLOOD INDEPENDENT'S #2

Well Data	2¼" Bore Tubing Pump	2½"x2" Bore "D-D" Pump
Pump Depth	1700'	1700'
Stroke	42"	42"
S. P. M.	26	26
Other Factors	Same	Same
Total Bbl. Fluid	665	1010
Bbl. Water	510	800
Bbl. Oil	155	210

Total increase: Fluid: 51.8%, Oil: 35.5%.

LOUISIANA — MAJOR'S #1

Well Data	2" Rod Pump	2"x1½" Bore "D-D" Pump
Pump Depth	2850'	2850'
Stroke	54"	54"
S. P. M.	19	17
Other Factors	Same	Same
Total Bbl. Fluid	533	826
Bbl. Water	497	756
Bbl. Oil	38	70

Total increase—Fluid 54.3%, Oil: 84.2%.

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or line scrapers. Full opening valves are used throughout the gathering system.

Hydraulic gradients are calculated on the basis of 200 bbl. per well per day and extended from the top level of the accumulation pit at the disposal well to a point no higher than 20 ft. above the ground level at any one treater. This is the approximate height of the siphon on a vertical treater and is equivalent to less than 10 psi. on a horizontal treater. The 200-bbl. per well per day basis was chosen to insure that oil production would not be penalized because of insufficient capacity of the disposal system.

Gathering-line capacities are in excess of probable disposal-well capacities. However, lines are located so that the disposal facilities can be appreciably increased by drilling additional disposal wells.

Use of pressure treating equipment tends to introduce entrained and solution gas into the gathering lines. This gas breaks out of solution when pressure is reduced or temperature lowered and accumulates at the high points, necessitating the use of vents to prevent gas locks. An alternative method to prevent gas locks in the line is to install a gas boot, which is essentially a separator operating at atmospheric pressure, between the meter and the tiein to the gathering line.

Under normal conditions the ditch is excavated and the pipe is bedded in accordance with manufacturer's specifications. Lines are encased in conduit at crossings of roads, railroads, and creeks to prevent failure due to settling. Soil-temperature surveys indicated that a 4½-ft. cover is required to prevent freezing, except for road crossings, where the line is buried 7 ft. because of deeper frost penetration. An analysis of the Redwater brine shows 100,000 p.p.m. dissolved solids, sp. gr. 1.07, and freezing temperature of 16° F.

It may be necessary in some instances to lower the ditch depth to stay below the hydraulic gradient. Some of the system has been installed through muskeg with underlying quicksand, which necessitated deviating considerably from standard installation methods. In such cases the ditch was excavated with a backhoe, pipe was installed with the use of chain hoists, and no more than 15 minutes could elapse between excavating and backfilling to avoid uplifting of the quicksand and floating the pipe out of the ditch.

Pits at the disposal wells were designed to handle fluctuations in the production rate, to reduce the velocity of the water to assist in the settlement of solids in suspension, and for the

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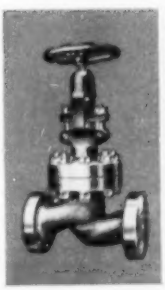

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Every step in supplying you with needed petroleum products—finding new sources of oil, drilling, refining, transporting, distributing—is a big job.

Last year, for example, we invested about $100,000,000 in the development of new sources of oil, including obtaining leases and drilling wells.

There are many other costly facilities too. A refinery of reasonable capacity and efficiency costs $25,000,000. One mile of pipeline may cost $35,000 or more to build today. And Standard Oil and its subsidiary companies have over 17,000 miles of pipelines. Other large amounts are required for expanded and improved marketing facilities—bulk plants, warehouses, service stations and motor equipment.

All told, to better serve a phenomenal growth in civilian and military needs, it will cost us more than $200,000,000 or about $600,000 every day this year to carry out our plans for new and improved facilities.

However, modern equipment operated by skilled employees helps us to produce and deliver a gallon of gasoline at a remarkably low price. And two gallons today do the work that took three in 1925.

And because Standard Oil has grown with your ever mounting demand for petroleum, because we have big facilities and big resources, we are able to do a big part of the big job expected of industry in a nation of Paul Bunyans.

Standard Oil Company
(INDIANA)

IF YOU HAVE VISITED Bemidji, Minnesota, you will remember seeing these giant statues of the legendary Paul Bunyan and Babe, the Blue Ox. Paul is symbolic of the American recognition that in a *big* country things have to be done on a *big* scale to meet a *big* demand.

IT TAKES BIGNESS in oil production to keep a mechanized nation moving ahead. Discovery of new sources of oil is vital. But drilling a wildcat well in an unproved area may cost more than a million dollars. And the odds are eight to one against finding oil in commercial quantities. Despite the cost and the risk, Standard Oil is constantly looking for and finding new petroleum sources to maintain the nation's reserves.

IT TAKES BIGNESS in research to keep up with the need for more efficient lubricants and fuels. A total of 2,500 people—men like Joseph J. Gregor of our Whiting laboratories—are employed in our research departments. In recent years we have plowed back about 66 cents out of every dollar of earnings in addition to borrowing over $300,000,000 to pay for expanded facilities, including research.

IT TAKES BIGNESS in planning to get ready for future demand. Right now we have a multi-million dollar pipeline building program under way. And more millions are going into the construction of a 30,000-barrel-a-day refinery at Mandan, North Dakota. The investment of almost 125,000 stockholder-owners—people like Mrs. Florence Luedeke (above) of Peoria, Illinois—makes possible such huge building programs.

flotation of oil carried over from the treating equipment. Pits and well cellars are constructed of reinforced concrete and are buried below ground level to prevent freezing and to obtain maximum head differential between batteries and disposal well.

Forms for pits were of plywood and the plywood was then used to construct a deck as nearly as possible vaporproof. Toxic gas from the pits is vented at a safe distance from the disposal unit.

Fluid enters the pit through a perforated spreader which reverses the direction of flow. Fluid is withdrawn at the other end of the pit through a perforated spreader approximately 6 in. higher than the pit inlet.

From the pits water is piped to the well cellar and is metered and injected into the disposal well. A separate water line is run from the accumulation pit to a float boot in the well cellar.

The float controls by mechanical leverage a ceramic-lined butterfly valve on the main from the pit. The valve closes before the fluid level in the pit will allow oil or air to enter the well tubing and completely opens before the fluid level in the accumulation pit reaches the overflow. The accumulation pit has an overflow through which oil may be skimmed and either picked up or burned at a burn pit.

The focal point of the gathering system is the disposal well. The well is geologically located in an area where it is considered that the formation will be most receptive to salt water injection. It is topographically located in an area of low elevation and geographically located at such a point as to serve a maximum number of batteries with the minimum size gravity lines and yet be within the limits of its injection capacity.

The existing disposal wells have been drilled with rotary equipment in the conventional manner. Surface casing is 10¾ in. o.d. set at 600 ft. and cemented to surface. The oil string is 7 in. o.d. set 300 ft. below the oil-water interface or at about 3,500 ft., and stage cemented to the surface. The stage method of cementing is used as a precautionary measure to prevent losing cement in the D-2 and to insure positive shutoff of the gas-bearing Cretaceous sands. Wells are drilled to the base of the D-3, or to a lesser depth if the formation characteristics appear good for water disposal.

Logs are run and tests are conducted during the well completion to determine the reservoir characteristics. When total depth has been reached, the open hole is thoroughly cleaned and the formation is acidized. At this point rotary equipment is moved off the hole.

Since the salt water is corrosive, it is injected through a tubing string rather than through the 7-in. casing. Plastic-coated tubing has been installed in the disposal company's well. Its use as a corrosion preventive in the Redwater area has not been fully evaluated.

Under static conditions the fluid level is approximately 2,200 ft. of salt water. In order to protect the inside of the casing and the outside of the tubing from salt-water corrosion, the fluid in the annular space between the tubing and casing is displaced with an equal weight light-gravity oil. The valve on the casing head is closed at static conditions and the gage reading is 0 psi. A decrease in injection rate together with an increase in casing pressure would indicate formation plugging. A decrease in injection rate together with little change in casing pressure would indicate plugging or scaling of the injection string. A sudden decrease in casing pressure would indicate a hole in the injection string.

Periodic checking of the flow rate and casing pressure gives a continuous record of the wells' condition and assists in forecasting the need for and type of remedial work required. This method of installing disposal-well tubing eliminates the need for a packer to protect against casing corrosion and the hazards attendant to its installation

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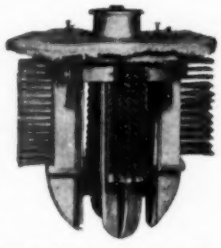

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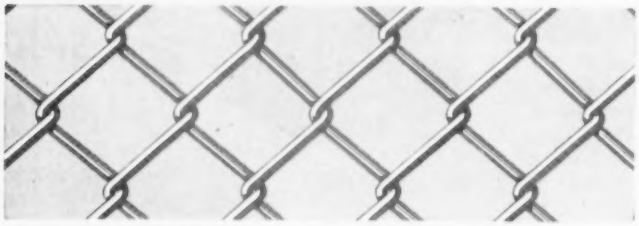

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and removal. It also provides information not available with the use of packers.

The disposal company is obligated to gather and dispose of all water tendered by the participating companies, either by truck or pipe line. Water is presently being received from 39 batteries; from 22 batteries by pipe line and 17 by truck. Approximately 75 per cent of the produced water is gathered by pipe line. Water produced from the north end of the pool is trucked to an unloading tank connected to the northern extremity of the pipe line.

The gathering system has been designed to handle water by gravity flow with the exception of one battery from which water is being pumped. Water received to March 1, 1953, amounted to 300,000 bbl. and was metered through fifty-two ⅝-in. meters at the batteries and three 2-in. meters at the disposal wells.

Squeeze-Cementing Mixture

(Continued from page 136)

mud-cleanout agent. Resulting production was 70 bbl. of pipe-line oil per day.

A well in the Gulf Coast area had been squeezed twice with water-cement slurries, but it continued to make 100 per cent water. A diesel-oil cement squeeze was performed with very good pressures being obtained with a relatively small volume of slurry. The well was then recompleted to produce, at last report, 179 bbl. of oil per day and no water.

Many brands of portland cement have been successfully mixed with oil using the surfactant. Very little difference could be detected in the various slurries as far as viscosity was concerned, but variations in their fluid loss properties were noted. Some brands of cement produced slurries that showed a very low fluid loss while others had relatively high losses. In all cases, fluid losses were less than those obtained with oil-cement slurries without the surfactant or with conventional water-cement slurries.

Although the diesel-oil cement slurry is relatively new, numerous jobs have been performed in several areas and the over-all results are very encouraging. All indications point to this new mixture being a valuable and efficient method of controlling unwanted water in oil-production problems.

Acknowledgment

The authors wish to express their appreciation to Halliburton Oil Well Cementing Co. for permission to publish this article and to Charles McLaughlin for his valuable help in the laboratory development of the method.

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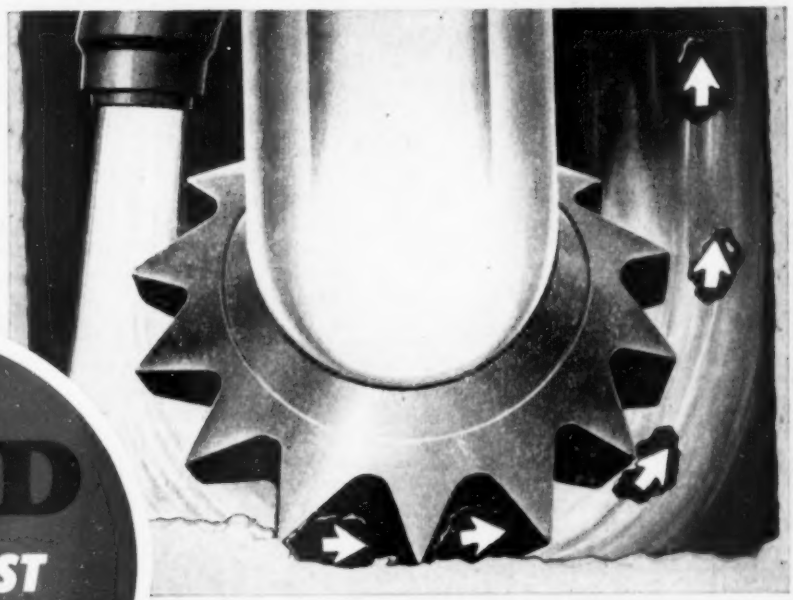
for faster drilling and more hole per bit



Rock bits drill faster and wear longer when the cutters are chipping on virgin formation rather than re-cutting formation already chipped loose.

REED Twin-Blast Rock Bits use the full energy of the mud stream to sweep the bottom of the hole clean. Powerful streams of drilling fluid blast cuttings up into the return mud stream.

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REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

3754

"Modern Muds Affect Drilling Rates"...

(Continued from page 127)

ing the sizes of holes, well 4 actually drilled 19 per cent more cubic feet of hole than well 3 but consumed 36 per cent more time in doing so. These calculations establish the fact that well 3 achieved 17 per cent better rate of penetration than well 4, which, as in wells 1 and 2, the difference in mud had a bearing upon drilling rates.

Discussion of Table 2

Here are the same circumstances as were found in the wells drilled by Contractor A. These four wells were all drilled in the same field under the same supervision which employed very similar drilling practices in drilling each of the four wells.

It is noted that well 2, with 2406 ft. of protective casing, achieved the better rate of penetration regardless of the fact that wells 1 and 4 used the same mud type with practically identical characteristics, but shorter protective strings of casing.

Well 3, drilling a 9-in. hole, had 3,786 ft. of surface pipe and averaged 12½ more days than the other three wells. After duly taking into consideration the larger hole drilled and the amount of protective casing it is obvious that mud types again seem to play a great part in influencing the rate of penetration.

Total number of bits used on these four wells differ considerably and cannot be explained since coring records from 8,000 to 9,000 ft. were not supplied, and in this particular area the consumption of bits in drilling the Travis Peak formation (8,000 to 9,000 ft.) varies somewhat from well to well.

Discussion of Table 3

Shortly after the protective casing was set in well 1 the drilling fluid was converted to a high pH low water loss mud in preparation for drilling the Anhydrite zone. This type of mud was maintained throughout the entire operation from a depth of 4,600 ft.

Wells 2 and 3 drilled through the Anhydrite zone with very fluid mud which had practically no chemical treatment. Protective casing was set immediately through the Anhydrite section and the Anhydrite contaminated mud was disposed of. Drilling under the casing was resumed with fresh, uncontaminated, low viscosity, low solids drilling fluid since all potential upper hole hazards were protected.

In Table 3 it is found that the mud characteristics, made possible by the amount of protective casing, effected a very definite rate of penetration.

No hole trouble, attributable to drilling fluid, was encountered in any of the three wells, and the total mud cost of well 1 averaged 30 per cent greater than that of either wells 2 or 3.

Discussion of Table 4

After analyzing these two well records it is found that well 1 had a net time on bottom with bit 10.9 days less than well 2, even though 145 cu. ft. more hole was drilled. In well 2 the drilling fluid was converted to a low water loss, starch, oil emulsion and CMC mud at 7,000 ft. and maintained as such to total depth, while well 1 gradually improved the mud characteristics in such manner that at the depth of approximately 8,500 ft. a high pH medium water loss mud was attained and used to completion.

Again it is found that mud types seem to have somewhat of an influence upon the rate of penetration.

Discussion of Table 5

Here, it is found that the first three wells maintained essentially the same mud types and characteristics, and attained very nearly the same rate of penetration, although well 2, with the shorter protective string, was the slower of the three.

Wells 4 and 5, employing identical casing and mud problems, attained very similar rates of penetration which exceeded those reached by wells 1, 2, and 3 even after taking into consideration the fact that wells 4 and 5 drilled 8¾-in. holes as compared to 9-in. holes drilled in the other wells.

Conclusions

In conclusion, proper drilling fluids are very essential for the drilling of oil wells. Proper drilling fluids are those which enable the driller to attain a maximum rate of penetration with a minimum of hazard involved. To arrive at a proper drilling fluid for any particular well being drilled, a thorough knowledge of drilling conditions to be coped with are essential and a day-by-day study of the behavior of that part of the hole which has been drilled is necessary. The hole being drilled cannot be fitted to the drilling fluid, thus the drilling fluid must be fitted to the hole.

TABLE 5*—WELLS DRILLED BY CONTRACTOR C IN SAME FIELD IN CENTRAL EAST TEXAS, UNDER THE SAME SUPERVISION

Mud type—	Caustic-Queb., Lignin-Starch			Caustic-Queb. Bentonite-CMC	
	Well 1	Well 2	Well 3	Well 4	Well 5
Depth, ft.	9,033	9,070	8,997	9,021	8,996
Size hole, in.	9	9	9	8¾	8¾
Protective casing, ft.	3,111	1,530	3,154	3,011	3,006
Bits used	31	31	38	30	26
Mud wt., lb.	Max. 11	Max. 11.2	Max. 11.1	Max. 10.5	Max. 10.6
Mud vis., cp.	35 to 60	35 to 55	36 to 52	35 to 48	35 to 47
Mud W.L., cc.	17 to 6.5	15 to 6.3	18 to 6.8	25 to 12.2	27 to 11.8
Net drill days	35.1	37.5	36.2	31.8	29.2

*Wells 1 and 2 were drilled with the same rig and crews while well 3 employed a different rig and crew. Wells 4 and 5 were drilled with the same rig and crew. All wells were drilled with comparable steam rigs.

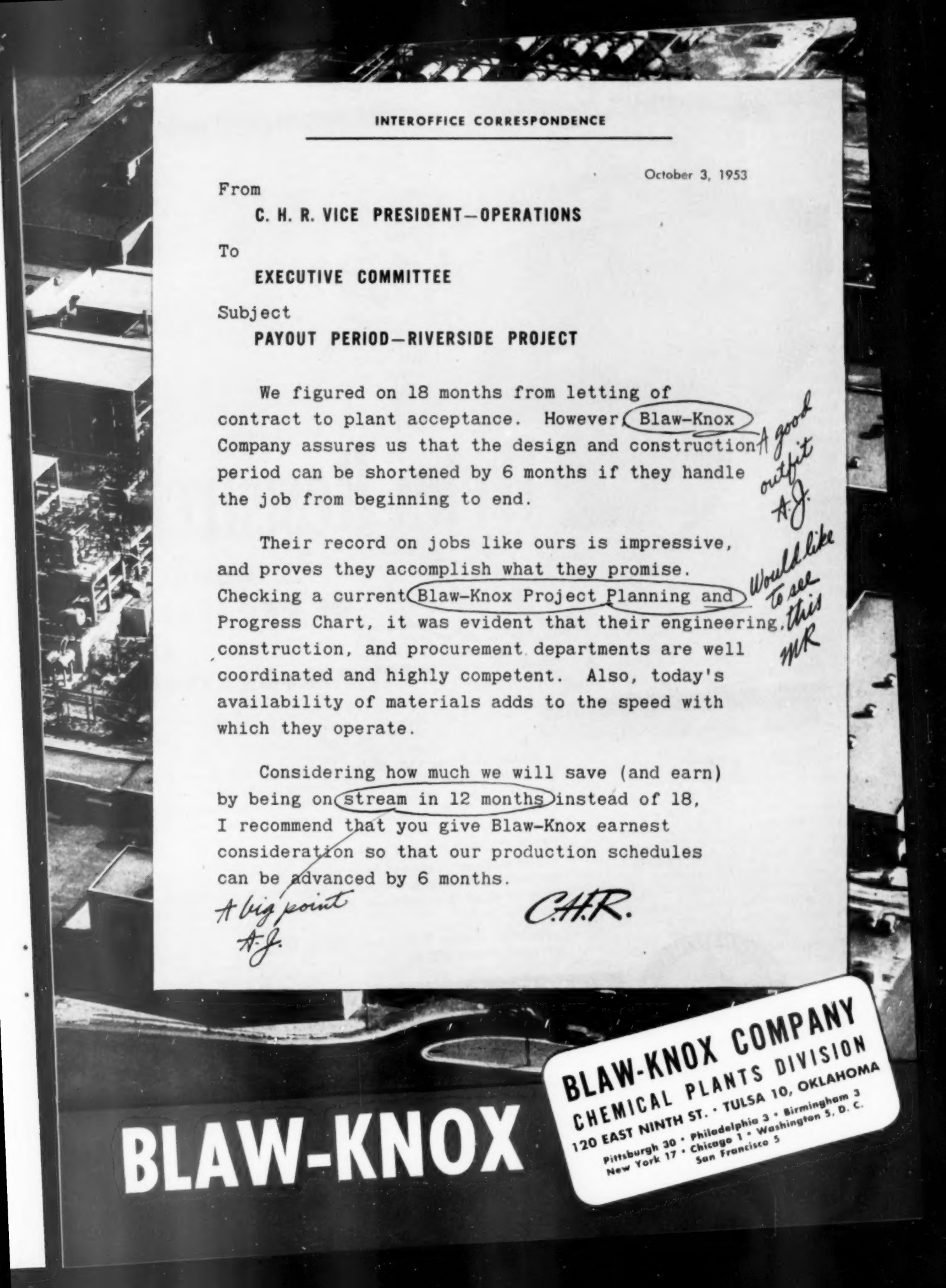
...In Gulf Coast Areas

by E. H. Lancaster, Jr.
Magnet Cove Barium Corp., Houston.

THE current trend toward increasing well depths, accompanied by tremendous increases in drilling and completion costs, has focused the attention of the drilling industry on ways and means of effectively reducing those costs. One of the most prominent contributions in recent years toward reducing well costs has been the development of jet bits which, with proper application of available hydraulic horsepower, have resulted in definite increases in drilling rates in various formations over a widespread area.

Part of the research conducted during the development of jet bits was concerned with the effect of various drilling fluids on rate of penetration. Briefly, the results of these tests indicated that drilling rates with water far exceeded those with mud; also, mud with a low viscosity and high water loss drilled considerably faster than one with high viscosity and low water loss, in most types of formations.

During recent years the use of jet bits has become quite common in the



INTEROFFICE CORRESPONDENCE

October 3, 1953

From

C. H. R. VICE PRESIDENT—OPERATIONS

To

EXECUTIVE COMMITTEE

Subject

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Gulf Coast area, with generally satisfactory results in improving drilling rates, in spite of the fact that formation conditions on most wells, more often than not, dictate the use of muds having properties somewhat different from those of clear water.

At this point, let us consider what is most desirable in the drilling of a well in regard to rate of penetration. Is it the greatest number of feet drilled per hour through a given formation? Or rather is it the shortest number of days to drill and complete the well, with a minimum of interruption of drilling progress due to hole trouble? It is felt that the latter is definitely the most important consideration, and one which is of mutual concern to both the contractor and the operating company.

The keys to optimum over-all drilling and completion rates in any area, taking into account the formations to be penetrated from surface to total depth, include proper choice of bits, an adequate casing program, as well as a sensible, well engineered mud program which will insure adequate protection of open hole during drilling operations, allow all casing strings to be set and cemented successfully at desired depths, and impede drilling rates as little as possible.

For the purpose of discussing modern Gulf Coast mud practices and their relation to rate of penetration, first, let us consider the role that native shale solids play in Gulf Coast muds. Examination of drilling and electric logs of most wells drilled in the area reveal the fact that frequently 80 to 90 per cent of the formations drilled are shale, much of which contributes rapidly to the solids content of the drilling fluid as drilling progresses. Without adequate dilution with water, the buildup of native solids may result in muds weighing as high as 10.5 to 11.5 lb. per gal., without addition of weighting material, often with fairly high viscosity and moderately low water loss.

A recent article by N. H. Wheless and Jack L. Howe (Drilling, August, 1953, page 70) ably demonstrates the fact that high concentrations of native solids definitely retard drilling rates, the authors cite two 6,000-ft. field wells, in the North Louisiana area, both of which were drilled with natural mud containing no commercial weighting material. On the first well the solids were allowed to build up to a resultant mud weight of 12.2 lb. per gallon at 4,700 ft. with very little reduction from that depth to 6,000 ft. This well required 23 bits and 25 days' drilling time between 1,800 and 6,000 ft.

On the second well sufficient water was added to the mud to maintain a range of mud weight from 9.2 to 10 lb. per gallon at 6,000 ft. This second well used 16 bits and 15½ days drilling time between 1,800 and 6,000 ft., effecting a saving of 7 bits and 9½ days' drilling time as a result of controlling the overconcentration of native shale solids in the drilling fluid.

It is thought that the primary reason for slower drilling rates with muds containing high native solids concentrations is that fluid turbulence is reduced at the bit, which in turn increases the tendency for balling to occur. The effect of low water-loss on rate of penetration is obscure; however, in general, most low water-loss muds have relatively high native solids content, whereas that of high water-loss muds is generally lower. Viscosity undoubtedly has contributory effect on rate of penetration because of its relation to turbulence at the bit: The higher the viscosity, the less turbulence available for dispersion of cuttings and cleaning the bit.

Gulf Coast Experts Polled

The subject of modern mud practices and drilling rates in the Gulf Coast area was discussed recently with a number of drilling contractors and representatives of operating companies. There was more or less general agreement that, with very few exceptions, drilling operations in this territory down to 7,000 ft., and often deeper, are seldom hampered by slow rates of penetration. The large number of wells drilled on the coast to 7,000 ft. or less, in years past, earned for the area the reputation of being "easy digging country."

However, the problem of rate of penetration becomes more noticeable as well depths approach the 10,000-ft. level and beyond. Formations not only are generally harder, but complicating factors such as abnormal pressures, sloughing shale, and possible salt water flows necessitate the use of muds designed to combat these problems successfully in order to drill to the objective. These muds often are not as effective from the standpoint of drilling rate as those used at shallower depths, but their use is more than justified from the standpoint of well protection. Even so, comparatively recent innovations in drilling fluid techniques have improved their drilling characteristics. These will be discussed later.

Lime-Starch Muds

During recent years, in the Texas and Louisiana Gulf Coast area, increasing well depths have resulted in the almost universal use of low water-loss lime-starch muds in the lower part of the hole. Breakover points will vary from approximately 6,000 to 9,000 ft., depending on the locality. The occurrence of abnormal pressures and sloughing shale zones frequently require muds weighing from 13.0 to as high as 18.5 lb. per gal., with water-losses ranging from 5.0 to 2.0 cc. or lower, and funnel viscosities normally from 45 to 65 seconds.

Lime-starch muds are capable of withstanding rather high concentrations of formation contaminants, such as salt or gypsum, with aluminum disturbance of desired properties, and generally exhibit a relatively high tolerance for the accumulation of native shale solids without undue increases in viscosity or gel strength. However, beyond a certain maximum, further increases in native solids will result in a very pronounced viscosity and gel strength increases. Because of the necessity for generally high mud weights and low filtration rates, there is a natural tendency for many drilling crews to add water sparingly to these muds, thus maintaining the maximum native solids content consistent with desired viscosities and gel strengths.

Consequently, lime-starch muds often demonstrate relatively poor drilling rate characteristics compared to muds containing lower solids content. It is thought that drilling rates might be measurably improved if sufficient water was added continuously to these muds to maintain their native solids contents at a minimum. Here again, it is possible that these solids induce at least momentary, if not more severe balling of the bit to retard drilling rates. Possible slight additional expense in weighting material and organic filtration control agents should be more than compensated for by savings in over-all drilling time.

Emulsion Muds

Since early in 1949, when initial field tests were made in the Gulf Coast area to evaluate the performance of oil emulsion mud as a means of increasing drilling rates, the use of this technique has gradually gained acceptance by numerous operators in the area. Most contractors are very enthusiastic because of very tangible results in savings of bits and drilling days, even when emulsions have been used over relatively short intervals of depth. There have been reported increases in drilling rates ranging from approximately 15 per cent to as high as 130 per cent over depth intervals varying from 500 to approximately 3,000 ft. Net savings in dollars over and above the additional cost of the emulsion mud over these same intervals have ranged from approximately $6,000 to $11,000.

Emulsions have been and can be used to advantage in all types of mud commonly employed in the Gulf Coast, provided the water-base mud to which

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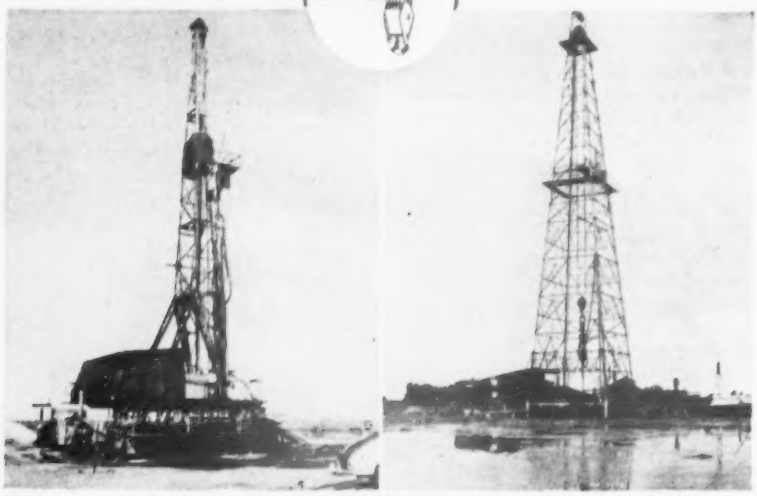

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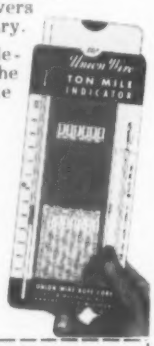

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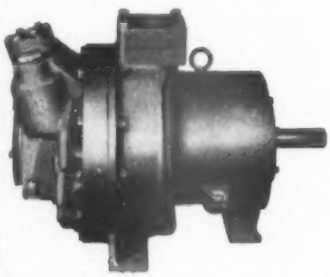

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the oil is added has been conditioned properly. Chemical control of these muds is similar to that used on the water-base mud, though often times somewhat less chemical is required.

Properly stabilized oil emulsion muds generally have filtration rates considerably lower than the water-base mud to which the oil is added, and therefore aid in control of sloughing shale as well as provide thin impermeable wall cakes through sand sections. Another benefit is prevention of hole enlargement through shale sections which is an aid in drilling operations as well as cementing casing.

Field—	Well depth (ft.)	Type of mud	Bits	Drilling days
Cameron, Louisiana	11,200	Water base	36	69
	11,600	Graphite	32	45
	11,500	Oil emulsion	28	41
Hull, Texas	8,600	Water base	21	34
	9,000	Graphite	20	27
	9,000	Oil emulsion	19	31

The increase in drilling rates derived from the use of emulsion muds is thought to be for the following reasons:

1. Reduction in torque and hole friction, resulting in more accurate indication of weight on the bit.
2. Prevention of balling of the bits.
3. Better lubrication of bit bearings and cutters, increasing bit life.

The principal objection to the use of emulsion muds has been from geologists who claim the presence of oil in the mud prevents accurate interpretation of the fluid content of formations. This objection has been avoided in many cases by the use of refined oil, such as diesel fuel.

It has been roughly estimated that, at the present time, emulsion muds are being used on approximately 25 to 30 per cent of all Gulf Coast wells, primarily for increasing drilling rates.

Powdered Graphite

A very recent innovation in drilling mud techniques on the Gulf Coast has been the addition of powdered graphite to the mud as a means of possibly increasing rates of penetration, and eliminating the geologists objections to oil emulsion muds. This material has been used on a test basis to a very limited extent by several operators to date. Reported results as to definite benefits gained in drilling rates for the most part have been somewhat obscure. However, most reports indicate that bit life is increased and pump and swivel performance is noticeably improved with less downtime for repairs.

One major operating company is doing considerable test work with graphite as a mud additive in several fields in Louisiana and Texas, with sufficiently encouraging results that they tentatively plan to use this material to further evaluate its effectiveness in improving drilling rates on all wildcat wells and about 50 per cent of their field development wells. The following data shows over-all results as to bits used and drilling days comparing water base, graphite, and oil emulsion muds:

This company reports that the addition of graphite to mud does not appear to affect its fluid properties in any way. There is no interference with electric logs or the evaluation of cores and cuttings. Slight decreases in rotating torque and pipe drag are noticed. Pump wear is apparently reduced sufficiently to effect a saving of approximately 25 per cent in replacement parts. Concentrations of graphite of 4 lb. per bbl. of mud are used in straight holes, and 6 lb. per bbl. in directional holes. From the standpoint of improving drilling rates, graphite appears to be generally about 50 per cent as effective as emulsion mud. The material seems to perform better while drilling sandy shale formations; performance is poorer in sticky shales.

...California Practice

by James D. Hawkins

Macco Corp., Paramount, Calif.

WE have found in California practice that inflexible generalizations cannot be made about oil base drilling fluids and their effects on rate of penetration. One will find areas and formations where oil base mud penetrates fastest; but also to be found are formations in which penetration rate by this medium is definitely slower, or slowest. It appears, however, that in oil sands or similar type sands, the rate is comparable (or even a little higher) to water base drilling.

The California rate of penetration is usually lower in hydratable shales, while it is generally the same in hard slaty shales. A major factor also to be taken into consideration on deep holes is the fact that bit life is 20 to 50 per cent longer in oil base mud (over and above the bit life obtainable with an emulsion mud). This results in considerable economy of round trip time and allows much more effective time on bottom.

Research Data Summarization

It appears to be the consensus of experienced opinion today that air or gas drilling is most efficient for the reason that high velocity of air or gas through bit orifices continually removes cuttings from the bit teeth—thereby greatly lengthening the life and efficiency of both bit and bearings.

By a considerable margin, water is not as efficient in this regard; although water does have advantages not found in any other drilling fluid. With water, for example, turbulent flow is practically always obtainable, and adequate velocity through the orifices is easily maintained.

Ordinary clay water mud, generally speaking, appears to be the poorest drilling medium we have today for bit penetration. The high solids content of this medium acts as an effective abrasive, wears out bits, dulls bit teeth, and requires higher pump pressures to obtain turbulent flow.

Oil emulsion drilling fluid is our best practical answer to the everyday problem of drilling through all types of formations. Emulsified oil—in addition to reducing torque on drill pipes—acts as a lubricant by coating all metal surfaces; and obviously, it eases the penetration of bit teeth into virgin formations. One can make a simple test of this technique by comparing the efforts required to push a dry needle, and then an oil wet needle, into a piece of paper.

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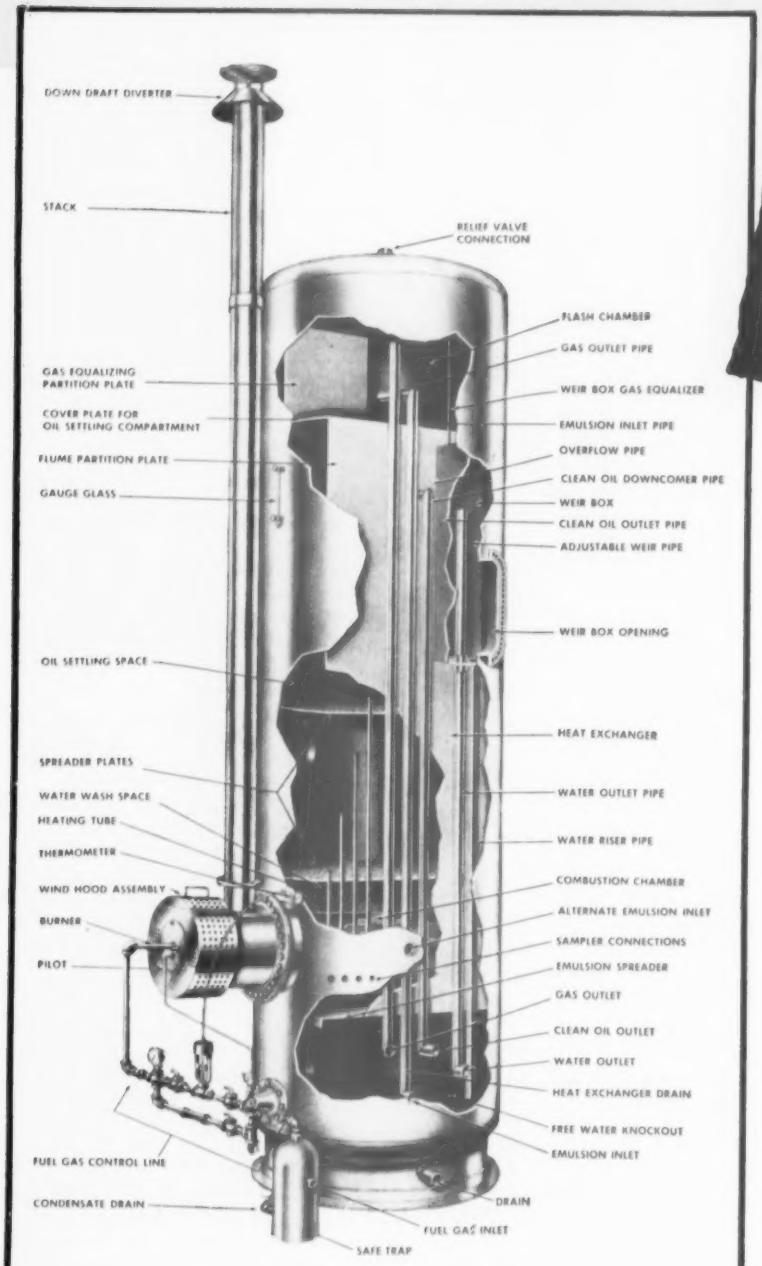

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More on Calculating Specific Speed

by Harold Woodhouse

THE actual cubic feet per minute at inlet conditions for a given suction pressure and corresponding to a stated flow in standard cubic feet per day may be determined from Fig. 1.

Using a minimum impeller inlet eye diameter of 12 in. and a minimum r.p.m. of 3,600, a complete framework is now set up for calculating the specific speeds of the various impellers other than the machined-from-the-solid type.

These specific speeds may be plotted separately but for quick comparison they are superimposed in Fig. 2.

The total ranges of specific speeds are seen to be as follows:

Radial	290- 640
Francis	490-1,390
Cast mixed-flow	815-1,800

One rather striking feature of Fig. 2 is that the radial type has a very limited range of application compared with the other types.

In some pipe-line compressor stations use has been made of impellers with vanes milled from solid steel forgings.

This type is often referred to as a Birmann impeller although the Birmann design refers to vanes generated in one specific manner.[1,2,3,4]

Two important general characteristics of the type are that in planes parallel to the inlet face and at right angles to the axis of rotation the vane sections are radial, thereby eliminating bending, and that the vane passage curvature, instead of being restricted to an inducer portion, is spread over the entire passage length.

The impeller discharge may be made radial or as for mixed flow.

The usual proportions for D_2/D_1, as previously stated, run from 1.2 to 1.7, but past test experience would indicate that maximum operating efficiency is attained where D_2/D_1 is 1.5 or over. However, these tests were for much higher tip speeds and gas velocities than are used in pipeline practice so that this factor may be insignificant in such use.

Author is chief engineer, Dean Hill Pump Co.

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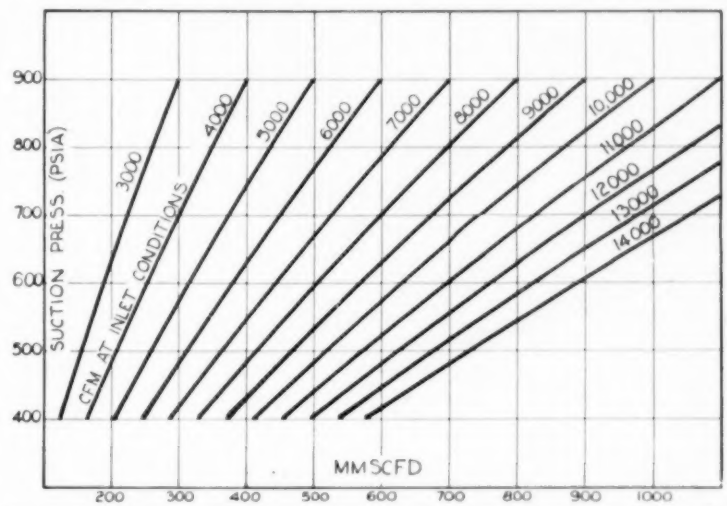

Fig. 1—Determination of cubic feet per minute at inlet conditions from given suction pressure and flow in standard cubic feet per day is facilitated by this chart.

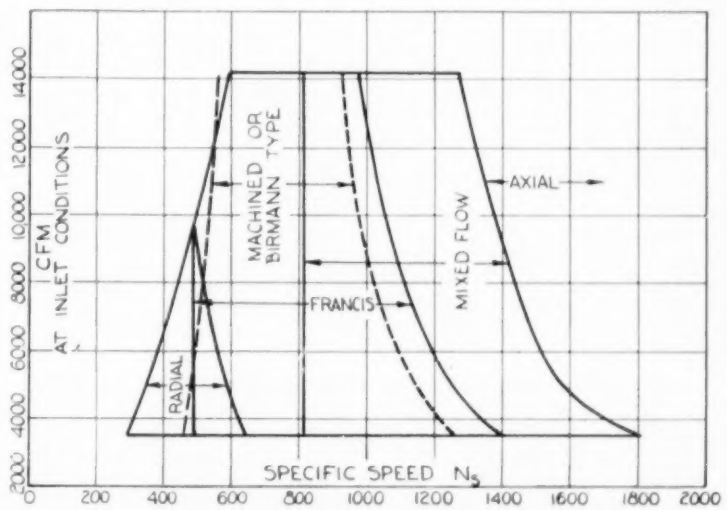

Fig. 2—Plot of specific speeds for different impeller types.

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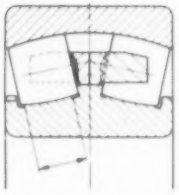

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How Many Refinery Employes, and What Do They Do?

by W. L. Nelson
Technical Editor

"What is the normal number of employes in a refinery and what proportion of them are used in maintenance and other types of work?"—D.J.F.

The number of employes in refineries is, of course, determined by the kinds of operations conducted and the size of the refinery. However, average personnel requirements can be judged from information given in References 1, 2, and 3, as summarized in Table 1.

The same information is also shown in Table 2 but with respect to regions of the United States. The Midwest, Southwest, and Rocky Mountain areas appear to appreciate salaried employes more than the other areas but the statistics might also be interpreted to mean that these areas are burdened with more overhead costs. Labor seems to be most effective in the Midwest, Rocky Mountain, and Pacific areas. Standard Oil Co. (N. J.) indicates that about 5.3 per cent of its employes have college degrees.[4]

Job analysis . . . An analysis of the types of job categories is difficult because each analyst must decide how to classify the man. However, Tables 3 and 4 are of some help. The analysis of C. W. Randle of 31.2 per cent of the employes of refineries in Texas, Oklahoma, and Louisiana in 1943 is shown in Table 3. The average capacity of these southwestern refineries in 1943 was 15,700 bbl. per day.

Table 4 is based on all refinery employes in the United States dur-

TABLE 1—APPROXIMATE NUMBER OF EMPLOYES IN PETROLEUM REFINERIES

Capacity (bbl. daily)	Refinery proper[1] Salaried	Refinery proper[1] Wage earners	Refinery proper[1] Total	Other head-office employes[2]	Notes
5,000	14	79	93	35	
10,000	27	164	191	78	
11,400			222		317 smaller U. S. refineries
20,000	54	356	410	182	
20,600	55	368	423	189	All U. S. refineries
30,000	79	552	631	303	
40,000	104	744	848	427	
50,000	127	940	1,067	535	
142,500			3,160		24 largest refineries

TABLE 3
Analysis of Job Categories of 31.2 Per Cent of Refinery Employes[3]

Category—	Per cent of type of workman
Carpenters A	0.37
Carpenters B	0.16
Electricians A	0.65
Electricians B	0.31
Firemen—stills	1.59
Guards	1.37
Janitors	0.53
Machinists A	1.34
Machinists B	0.75
Pipefitters A	0.94
Pipefitters B	0.90
Pumpmen	2.53
Pumpmen helpers	1.40
Routine testers	2.00
Stillmen:	
Cracking	1.37
Other	2.09
Helpers No. 1	2.90
Helpers No. 2	1.22
Stock clerks	0.37
Treaters	1.15
Treaters helpers	0.93
Truck drivers:	
2½-ton	0.66
Over 2½-ton	0.59
Watchmen	1.40
Welders A	1.34
Welders helpers B	0.47
Working foremen—process departments	0.28
Centrifuge operators	0.22
Chiller men	0.16
Compounders	0.15
Filtermen	0.28
Packers—hand or machine	0.25
Pressmen—filter	0.37
Wax operators	0.12
Unclassified	68.84

TABLE 2—APPROXIMATE NUMBER OF REFINERY EMPLOYES PER 10,000 BBL. PER DAY OF CAPACITY WITH RESPECT TO REGIONS OF THE UNITED STATES

Region*—	No. of plants, 1950	Average plant capacity, bbl. daily 1950	Employes per 10,000-bbl. per day capacity—1950, The Oil and Gas Journal[1] Salaried	Wage earners	Total	1948 Bureau of Labor[2] Other head-office employes	Ratio of wage earners to salaried employes
Rocky Mountain	45	5,750	28.2	161	189	†56	5.7
East South Border	17	10,450	23.6	250	274	†31	10.6
New England	5	12,000	23.5	207	230	†78	8.8
Middle West	22	12,650	30.9	156	187	†115	5.1
Pacific	53	20,500	22.7	176	199	70	7.8
Great Lakes	57	21,800	24.9	161	186	†108	6.5
Southwest	112	25,700	29.5	172	202	65	5.8
Mid-Atlantic	30	34,700	26.6	230	257	192	8.6
All	341	20,600	27.1	181	208	†90	6.7
24 largest	24	142,500			222		
317 others	317	11,400			195		

*Rocky Mountain: Colorado, Idaho, Montana, New Mexico, Utah, Wyoming. East South Border: Delaware, Georgia, Kentucky, Maryland, South Carolina, West Virginia. New England: Massachusetts, Rhode Island. Middle West: Kansas, Missouri, Nebraska, South Dakota. Pacific: California, Oregon, Washington. Great Lakes: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin. Southwest: Alabama, Arkansas, Louisiana, Mississippi, Oklahoma, Tennessee, Texas. Mid-Atlantic: New Jersey, New York, Pennsylvania. †Doubtful because Bull. 994 does not make entirely clear what is contained in its figures.

TABLE 4—DISTRIBUTION OF WORKMEN IN ALL U. S. REFINERIES (1950)[1]

	Total employes	Per cent of each kind	No. of employes for 20,000 bbl. daily
Administrative:			
Executives	1,679	1.1	4.8
Bookkeeping	2,929	2.0	8.3
Sales	146	0.1	0.4
General clerical	3,415	0.37	9.7
Total	8,169	5.57	23.2
Technical:			
Process engineering and research	5,743	3.9	16.4
Equipment and design	1,612	1.1	4.6
Lab. control and testing	9,225	6.3	26.2
Total	16,580	11.3	47.2
Production and manufacture:			
Process management	443	0.3	1.3
Distillation (steam and vacuum)	4,978	3.4	14.1
Cracking (thermal or catalytic)	4,393	3.0	12.5
Alkylation	1,903	1.3	5.4
Gas recovery and stab.	2,635	1.8	7.5
Dewaxing	6,150	4.2	17.5
Finishing (various treating, etc.)	7,907	5.4	22.7
Total	28,409	19.4	61.0
Pump houses	7,468	5.1	21.3
Maintenance and repair:			
Planning and control	1,906	1.3	5.4
Equipment repair and maintenance	3,221	2.2	9.2
Machine shop	7,029	4.8	20.1
Instrument repair	2,051	1.4	5.8
Structure maintenance	7,907	5.4	22.6
Pipe fitting and covering	14,497	9.9	41.3
Plate fabrication and repair	4,246	2.9	12.1
Tank-car repair	732	0.5	2.3
Yard labor	10,543	7.2	30.2
Total	52,132	35.6	149.0
Utilities	4,686	3.2	13.3
Warehouse—shipping, receiving and storage:			
Supervisory and clerical	4,541	3.1	12.9
Container repair, preparation and filling	6,150	4.2	17.5
Loading (truck, ship, train)	4,832	3.3	13.7
Salvage yard	1,610	1.1	4.6
Total	17,133	11.7	48.7
Protection and custodians	11,862	8.1	33.8
Grand total	146,439	100.0	417.5

ing 1950 but it does not include head-office employes. It represents more detail but it does not list specific job categories. Accordingly, some of the job categories that might be included in each division are listed here:

ADMINISTRATIVE:

Executive—Vice president, manager, superintendent, purchasing agent, chief engineer, etc.

Bookkeeping—Accountant, assistant accountants, timekeeper, cashier, etc.

Clerical—Assistant purchasing, office manager, clerks, telephone operators, secretaries, stenographers, etc.

TECHNICAL:

Engineering and design—Process, maintenance, assistant chief engineer, corrosion, inspector, assistant inspector, electrical structural, draftsmen, librarian, development, etc.

Laboratory—Chief chemist, chemists, analysts, testers, engine operators, sample boy, bottle washers, gas testers, etc.

PRODUCTION and MANUFACTURE:

Management—Chief operator, assistant superintendent, night superintendent, labor-relations manager, etc.

Operations—Shift foreman, shift analysts, cracking stillmen, topping stillmen, stillmen helpers, firemen, etc.

PUMP HOUSE and UTILITIES: Marine manager, crude transfer, product transfer, water circulation, loading rack, gagers, TEL blending, utility foremen, power-plant supervisor, firemen, etc.

MAINTENANCE and REPAIR: Maintenance foreman, chief machinist, master mechanic, electrician foreman, straw bosses, machinists and helpers, mechanics and helpers, master welder and welders, blacksmiths, tinners, boilermakers, pipefitter foreman and helpers, instrument mechanics and helpers, electrician helpers, carpenters, insulators, painters, masons, pump repairmen, truck drivers, riggers, burners, crane operators, yard labor, grader operators, etc.

PROTECTION: Janitors, watchmen, guards, guides, timekeepers, etc.

WAREHOUSE, etc.: Manager, stock clerks, receiving clerks, unloaders, packers, salvage-yard workers, etc.

References

1. Anon., "A Census of Plant Capacity Distribution and Manpower in the United States Refining Industry," The Oil and Gas Journal, March 29, 1951, p. 220.

2. Bull. 994, "Employment Outlook in Petroleum Production and Refining," Bur. of Labor Statistics, U. S. Dept. of Labor, September 1, 1950.

3. Randle, C. Wilson, "Analysis of Southwestern Petroleum Refining Wages," Pet. Engineer, December 1943, p. 101.

4. National Petroleum News, May 1, 1946, p. R-323.

Comment—Viscosity Slide Rule

REGARDING the answer in the May 4, 1953, issue regarding a slide rule for computing (1) viscosities at different temperatures, (2) amounts of oils to use in blends, and (3) viscosity index, General Manager E. C. Isom, of Sinclair Refining Co., has the following useful comments to make:

"As a matter of interest I enclose a copy of 'Handbook of the Tag-Isom Blending Calculator.' This instrument was covered by U. S. Patent 1570352 dated 1926, since expired. The instrument was manufactured for C. J. Tagliabue Manufacturing Co., of Brooklyn, by Keuffel & Esser Co. and distributed by Tagliabue. A considerable number of them were sold, but eventually the market appeared to become saturated. Later viscosities in common use ran into such high ranges that this instrument, in order to be practical, would have had to have been revised to accommodate them.

"The instrument was quite accurate in operation. By its use it is possible to obtain blends of oils within a tolerance of 1 to 2 seconds Saybolt viscosity. I find that it is still used in a number of laboratories and compounding plants of the petroleum industry throughout the country."

ASPHALT ANALYSIS—5

Making Empirical Correlations

by R. N. Traxler* and H. E. Schweyer†

A METHOD by which refractive index of dark samples can be determined was given in the preceding installment and its application toward finding per cent by volume of asphalt and oil in a mixture was discussed. This was illustrated on a plot of refractive index versus volume per cent of solvent.

Calculations for determining the composition by volume are as follows:

Calculations

To determine per cent by volume composition at 25° C. (77° F.):

$$A = \frac{\text{Wt. of asphalt}}{\text{Sp. gr. of asphalt, 25° C. (77° F.)}}$$

= Volume factor for asphalt

$$B = \frac{\text{Wt. of oil}}{\text{Sp. gr. of oil, 25° C. (77° F.)}}$$

= Volume factor for oil

$$P = \frac{100\ B}{A + B} = \text{vol. per cent of oil}$$

*The Texas Co., Port Neches, Tex.
†University of Florida, Gainesville, Fla.

Note (1) Density of water taken as 0.09970 gm./cc. at 25° C. (77° F.) if desired to convert volume factor to actual volume.

Note (2) In some cases it may not be possible to use this method for the purpose intended because the sample is either too dark, too viscous, or not soluble in the softening oils.

As noted above the interpretation of refractive index must be qualified by the physical properties of the material being studied.

An empirical relation between refractive index at 70° C. (158° F.) and density at 25° C. (77° F.) is shown in Fig. 1 for oily fractions obtained from different asphalts (selected as being representative of the variety found in practice) by solvent extraction. It is interesting that materials which plot appreciably above the line are considered relatively aromatic (for example, many pressure still residues), whereas those falling below the line are usually paraffinic (e.g., paraffin wax).

Although the limitations might appear to be critical, it is believed that the measurement of refractive index provides a characterization of the material which can be a valuable aid in explaining the behavior of asphaltic substances and in describing the uniformity of such materials.

Another empirical relation[1] that provides some information concerning the composition of petroleum asphalts is illustrated in Fig. 2. This relation between density and carbon/hydrogen ratio for various components of asphalts serves as another approximation in determining the types of compounds that may be present.

In the remaining installments of this series on asphalt analysis a table and triangular chart will be presented showing the use of component analysis to explain the changes undergone by a residuum when it is processed to asphalt. The effect of both vacuum reduction and air blowing on composition and refractive index will be considered.

Further discussion will be given on component analysis of asphalts recovered by the Abson method. Tabular data will be presented to point up this part of the discussion. Another table will indicate sulfur distribution in components of asphaltic residua. Possible actual composition of the components fractions will be reviewed on the basis of the work of other investigators.

Reference

1. Knowles, Eckert, McCoy, and Westman. Presented at 117th meeting, A.C.S., Houston, Tex., 1950.

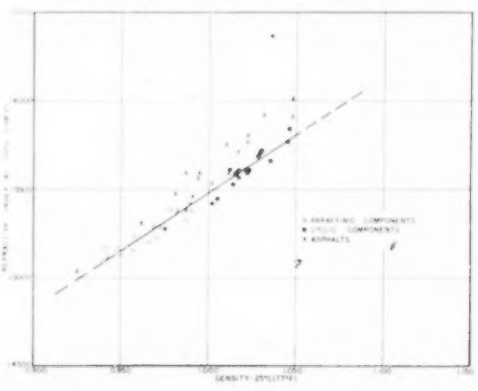


Fig. 1—Empirical relation between refractive index and density.

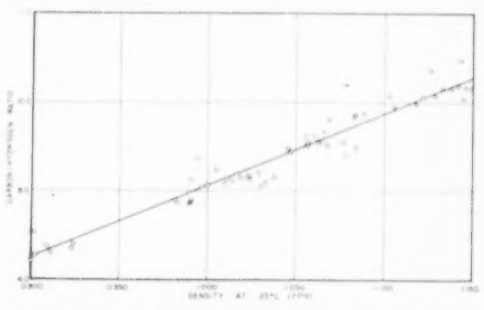
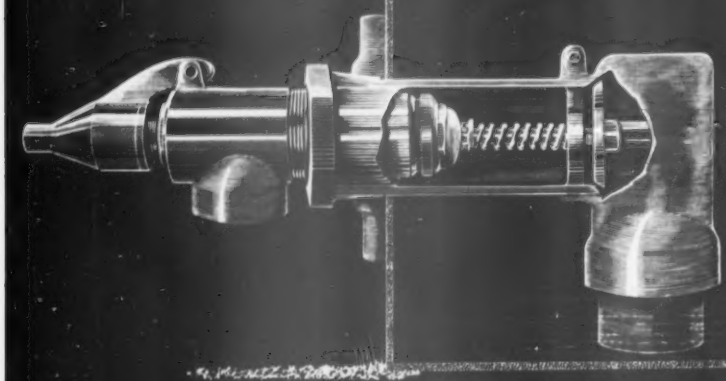


Fig. 2—Relation between density and carbon-to-hydrogen ratio for various components of asphalts.

ANTI-FREEZE DRAIN-VALVE for all types of tanks

Here is the Shand & Jurs Anti-Freeze Valve for draining off water in the bottom of oil storage tanks. It is self draining. Water will not stay inside the valve body, thereby eliminating the chance of rendering the valve inoperable as a result of freezing. The S&J Anti-Freeze Valve will do its job with dependability in any weather.



Designated by S&J, Fig. ST-2001, the Anti-Freeze Valve is available with brass or stainless steel trim. It is adaptable to any type of petroleum tank. Its protective cap can lock the valve closed, preventing any tampering with the tank's contents. The cap is slotted in the small end, and is used as a wrench to open or close the valve.

Fig. ST-2001 Anti-Freeze Valve with adapter for Cone roof tanks.

Fig. ST-2001 AV Anti-Freeze Valve with auxiliary valve which permits removal of the drain valve from a tank without draining tank contents.

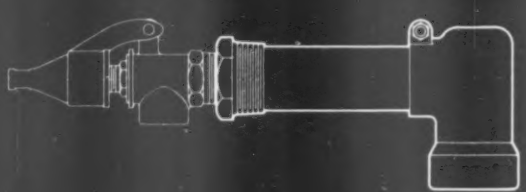
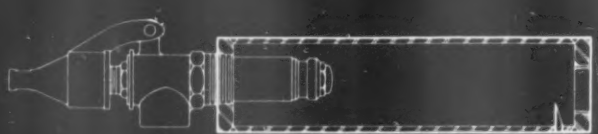


Fig ST-2001 S Anti-Freeze Valve with eccentric sleeve, designed for use in Spheroids and other tanks without flat bottoms.



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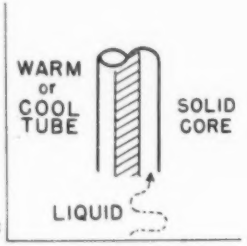
Part 47 of a series

by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between INSIDE of a TUBE and a LIQUID



Tube partially filled by solid core

Fluid Movement: Turbulent

Tube Position: Horizontal or vertical

Direction of heat flow: Heating or cooling

Special Consideration: Liquid of high viscosity

EQUATION:

$$h_f = 0.027 \frac{K}{De}\left[\frac{De\,G}{\mu}\right]^{0.8}\left[\frac{C\mu}{K}\right]^{0.33}\left[\frac{\mu}{\mu_s}\right]^{0.14}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of fluid, BTU/hr.sq.ft.°F./ft.

De - $D_2 - D_1$.

D_2 - Diameter of inside of tube, ft.

D_1 - Diameter of core, ft.

G - Mass velocity through annular space, lb./sq.ft.hr.

μ - Viscosity (μ_s at surf. temp.) of liq., lb./hr.ft.

C - Specific heat of fluid at constant pressure, BTU/lb. °F.

LIMITATIONS:

Used for liquids of viscosity more than two times that of water.

Reynolds number (DeG/μ) should be above 10,000.

PHYSICAL CONSTANTS:

The values of the physical constants such as density, viscosity and others are reported in the International Critical Tables, in several handbooks, and in the technical literature.

Page references in the Chemical Engineers' Handbook, J. H. Perry (1948) are as follows:

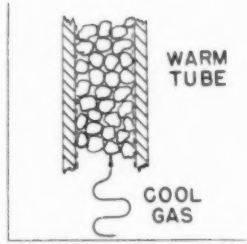
for ρ - 130-148, 175-195, 1583.
μ - 370-374, 1198, 1696.
K - 459-461, 1303, 1697.
C - 225-235, 297, 1588, 1696.

REFERENCES:

1. Heat Transmission, William H. McAdams, page 200.
2. Process Heat Transfer, D. Q. Kern, pp. 209.

T 2,5 c (3)

COEFFICIENT of HEAT TRANSFER through FILM between INSIDE WALL of WARM TUBE and COOL GAS



Gas Movement: Turbulent

Tube: Packed with granular solid or lumps

EQUATION:

$$h_f = 0.813 \frac{K}{Dt}\left[e^{-6\frac{Dp}{Dt}}\right]\left[\frac{Dp\,G}{\mu}\right]^{0.90}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of gas at average temperature, BTU/hr.sq.ft.°F./ft.

Dt - Inside tube diameter, ft.

e - Base of natural logarithms

Dp - Particle diameter, ft.

G - Mass velocity, lb./hr. sq. ft. based on inside area of pipe.

μ - Viscosity of gas, lb./hr. ft.

LIMITATIONS:

Applicable for turbulent, vertical flow through tubes packed with material of low thermal conductivity.

Modified Reynolds number (D_pG/μ) should be above 400.

$0.3 > \frac{D_p}{D_t} > 0.05$
S in.$> D_p >$ 1/2 in.

($C_p \mu / K$) for the gas should approximate that for air (0.74).

PHYSICAL CONSTANTS: The values of the physical constants such as density, viscosity and others are reported in the International Critical Tables, in several handbooks, and in the technical literature.

Page references in the Chemical Engineers' Handbook, J. H. Perry (1948) are as follows:

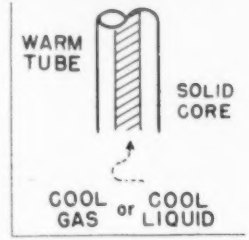
for K -- 459-461, 1303, 1697.
ρ -- 130-148, 175-195, 1583.
μ -- 370-374, 1198, 1696.

REFERENCES:

1. Max Leva, Ind. & Eng. Chem., 39, 857 (1947).

T 4 c (1)

COEFFICIENT of HEAT TRANSFER through FILM between INSIDE of a WARM TUBE and a FLUID



Tube partially filled by solid core

Tube position: Horizontal or vertical

Fluid movement: Turbulent

EQUATION:

$$h_f = 0.023 \frac{K}{De}\left[\frac{De\,G}{\mu}\right]^{0.8}\left[\frac{C_p\,\mu}{K}\right]^{0.4}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of fluid, BTU/hr.sq.ft.°F./ft.

De - $D_2 - D_1$.

D_2 - Diameter of inside of tube, ft.

D_1 - Diameter of core, ft.

G - Mass velocity through annular space, lb./sq.ft.hr.

μ - Viscosity of fluid, lb./ft.hr.

C_p - Specific heat of fluid at constant pressure, BTU/lb. °F.

LIMITATIONS:

Use of this equation is limited to gases and to liquids of viscosity not more than twice that of water.

PHYSICAL CONSTANTS:

The values of the physical constants such as density, viscosity and others are reported in the International Critical Tables, in several handbooks, and in the technical literature.

Page references in the Chemical Engineers' Handbook, J. H. Perry (1948) are as follows:

for ρ - 130-148, 175-195, 1583.
μ - 370-374, 1198, 1696.
K - 459-461, 1303, 1697.
C - 225-235, 297, 1588, 1696.

REFERENCES:

1. Heat Transmission, William H. McAdams, page 200.
2. Process Heat Transfer, D. Q. Kern, pp. 209.

T 4,5 c (2)

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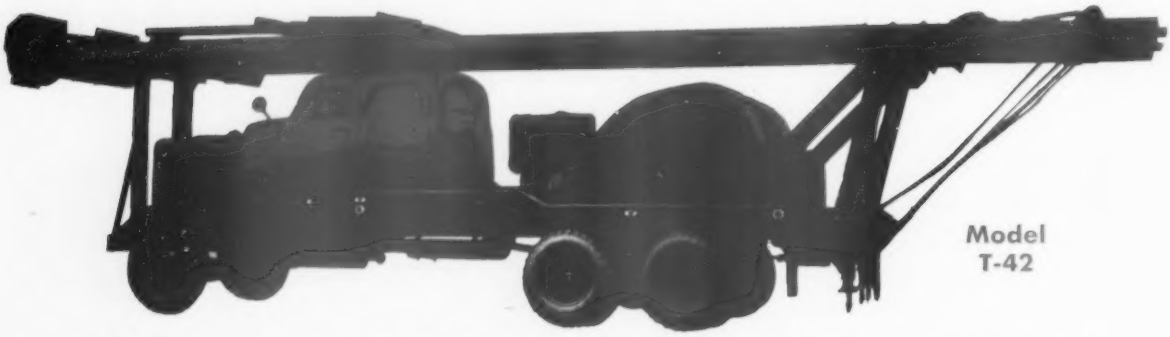

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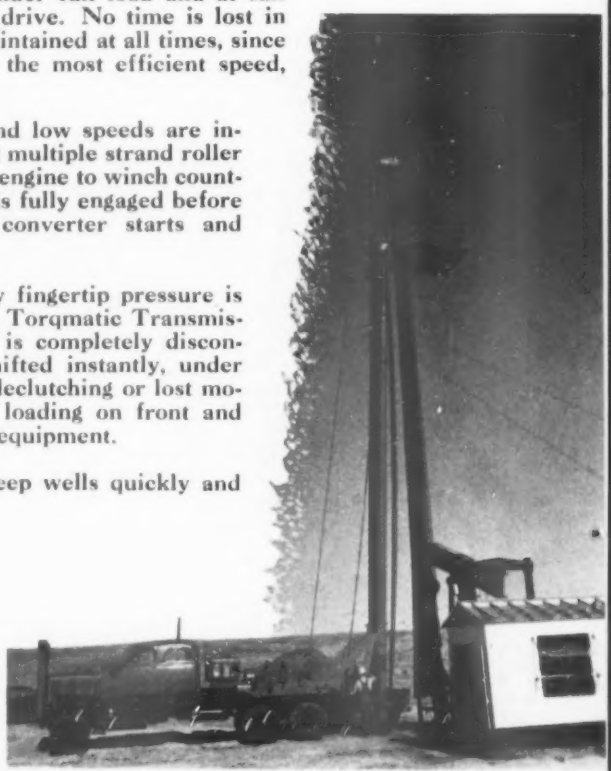

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How to Select Size of Rectifier Cable

by Marshall E. Parker

IN many cases, the selection of the connecting cables for a cathodic-protection system employing a rectifier and an anode bed is made by arbitrary rules, often based solely upon the value of the current to be carried. This does not, in general, result in the choice of the most economical size; such a choice must include certain other factors in addition to current.

Several formulas, equations, and tables have been published on this subject, and the chart offered here differs only in the mechanics of its use. The fundamental principle involved is that the cable size must be chosen so that the total annual cost will be a minimum; and this total annual cost is made up of two parts: the annual charges against the initial investment, and the power costs of the losses in the cable.

Balanced design . . . If the cable selected is small, the first of these parts will be small, but the second will be too large; conversely, if too large a cable is used, the annual charges against investment will be so large as to more than offset the savings in lower power losses. There is an optimum size, for which the sum of these two expenses is a minimum, and that size can be calculated by the methods of the differential calculus.

To do this, it is necessary to express all of the costs (per unit length) as functions of the cable's cross-sectional area, sum them, differentiate this function with respect to the area as an independent variable, set this derivative equal to zero, and solve. When this has been done, the following solution is found:

$$a = 5{,}420\ I \sqrt{\frac{P}{E\,C\,K\,Q}}$$, where

I = current in amperes
P = power cost, in cents per kilowatt-hour
E = rectifier efficiency, expressed as a fraction
C = base price of copper, cents per pound
K = a constant for the type of wire to be used, to convert base copper price into wire price
Q = annual charge equivalent to an investment, expressed as a fraction.

The chart results from transforming and simplifying the above expression. In order to use it, the quantity

$$\frac{I^2\,P}{C\,K}$$

is computed, the symbols having the same meanings as given above. The simplification results from assuming 50 per cent over-all efficiency for the rectifier, and from adopting 15 per cent as the annual charge against an investment; the use of a logarithmic scale and the direct entry of wire sizes instead of cross-sectional areas further simplifies the use of the diagram.

Typical values for the constant K are as follows:

Bare stranded wire,	K = 1.16
WP insulation	K = 1.25
Neoprene sheathed	K = 4.25

A more precise result may be had by first determining the approximate size required, and then determining the true value of K by obtaining prices on the type cable contemplated, and reducing them to actual net price of copper per pound; this value is then used for CK.

In locations where very cheap power is available, as in large plants or refineries where power is either generated or purchased wholesale, the cable sizes given by the chart are so small as to be of questionable correctness. However, although it may be desirable to increase the size for mechanical strength or even (in extreme cases) to avoid actual heating, the value found by the above formula or by the chart does represent the true minimum annual cost insofar as the two factors considered are concerned.

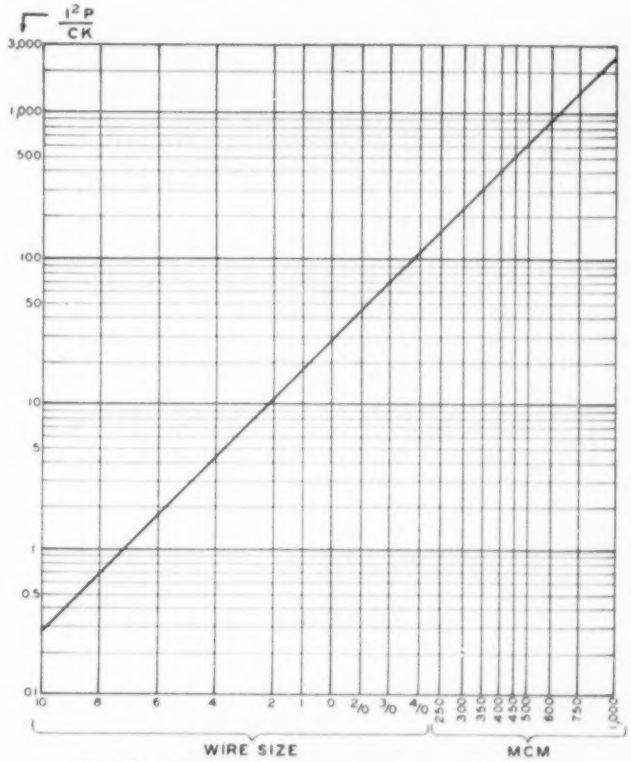

Chart for estimation of economic size of rectifier cable.

Author is a corrosion consultant, Houston.

EQUIPMENT MEN . . . in the News

Hilker Elected S.A.I.E. National President

F. C. (Bud) Hilker, public relations and advertising manager for Eastman Oil Well Survey Co. at Denver, was elected national president of the Society of Associated Industrial Editors at the organization's convention held in Omaha in late September.

Hilker, who has been associated with Eastman since 1948, is publications director for the company and has been active in S.A.I.E. in Denver for several years. He is a past president of the Colorado editors' group.

Wheland Executives Examine HP-14,000 Slush Pump

George E. Campbell (right), development engineer, Wheland Co., Chattanooga, Tenn., and Earl Shorts (left), veteran Wheland field service executive, with Wheland HP-14,000 duplex slush pump. Campbell, who designed and engineered this and other Wheland pumps, has earned an international reputation for his work in this field. He has been responsible for many engineering advances and holds a number of patents on his inventions. Shorts lives in Oklahoma City. He has been working with oil-field machinery since the age of 13 when he got his first job on a drilling rig in the Pennsylvania oil fields. He has been a field service man for Wheland for the past 30 years and is widely known throughout Texas, Oklahoma, and Kansas oil fields.

Graver Tank Forms New Oil Field Supply Division

J. E. FOGARTY

From its East Chicago, Ind., headquarters, Graver Tank & Manufacturing Co., Inc., has announced the formation of a separate division for the sales and service of oil-field equipment. Known as Graver Supply Co., this division is under the direction of J. E. Fogarty, Mid-Continent area manager for Graver's plants in Sand Springs, Okla., and Odessa, Tex. As general manager of the new Graver Supply Co., Fogarty has established sales offices and storage yards in a number of cities throughout the Southwest.

Fogarty is an engineering graduate of Purdue University and has directed Graver's Mid-Continent fabricating and sales since Graver acquired its Oklahoma plant in 1946. His experience has included plant supervision at Mt. Vernon, Ill., and at Graver's main plant at East Chicago.

Gerald G. Byer has been appointed area manager for Oklahoma - Kansas territory and has set up offices in Tulsa. George Byer and Jerry Byer are manning branch offices in Oklahoma City and Great Bend, Kans., respectively. Henry F. McCabe covers the district around Ardmore, Okla.

A second sales area covers West Texas and New Mexico, headed by J. E. Hobson at Odessa, Tex., where Graver recently located a fabricating plant under G. W. Myer as superintendent. Hobson is assisted by A. T. Arnold at Odessa, and by subordinate sales offices in Hobbs, N. M., Abilene, and Dallas, Tex. J. G. Scofield heads the branch office at Hobbs, R. R. Cowan at Abilene, and M. J. Bridges in Dallas.

For the Gulf Coast area, arrangements have been made for the marketing of Graver-built well-head equipment from Houston as a center, through Murphy Tank Co., of which E. G. Murphy is president. To provide immediate service, a large storage yard is already in operation at Houston.

Norton Co. Names Lusher Refractories Engineer

Gerald H. Lusher has been appointed a refractories engineer by Norton Co., Worcester, Mass. He has been assigned a new territory centered around Louisville and Cincinnati, including the southern counties of Ohio and Indiana, all of the states of Kentucky, Tennessee, Georgia, Alabama, and Mississippi.

Prior to entering the Norton sales training course in 1951, Lusher was an assistant ceramic engineer for Basic Refractories in Ohio. Since July 1952, he has been a member of Norton's refractories sales-engineering department.

Emsco to Manufacture Ball Bearing Swivel Fittings

In a trend to wider diversification of the Emsco line of oil-field and related products, the addition of a swivel-fitting department has been announced by William T. Powell, president of Emsco Manufacturing Co.

W. T. POWELL

E. R. ATKINS

Emsco has acquired the swivel-fitting business of the Rasmussen Manufacturing Co., Hollydale, Calif. These fittings, formerly sold under the trade name Ramsco, will be known as Emsco swivel fittings.

Heading up the swivel-fitting sales program will be E. R. Atkins. For over 25 years Atkins has been associated in the manufacture and sales of swivel joints, rotary heads, and rotary pressure hose for both domestic and export markets. Atkins will make his headquarters at the Los Angeles plant of Emsco.

Babcock & Wilcox Co. Promotes Thomas, Utnehmer

William J. Thomas, general sales manager, has been appointed general manager of the Tubular Products Division of Babcock & Wilcox Co., and Paul J. Utnehmer, works manager, has been named to the board of directors of the division, it was recently announced by Edward A. Livingstone, vice president.

Thomas has been with B. & W. since 1932. He was associated with the boiler division of the company at Barberton, Ohio, until 1941 when he left his position as assistant manager of the process-equipment department to join the Tubular Products Division. He was named assistant general sales manager in 1942 and general sales manager in 1948 and was appointed to the board of directors of the Tubular Products Division in September 1952.

W. J. THOMAS

P. J. UTNEHMER

Utnehmer has been with the company since 1945. Prior to coming with B. & W. he was associated with a nationally known management-engineering firm. He came to the Beaver Falls plant of the Tubular Products Division from the Alliance plant in 1946 where he was management engineer. He was named works manager at Beaver Falls in 1948.

Harris Appointed Sales Engineer by Beaumont Iron

Beaumont Iron Works Co., a subsidiary of American Locomotive Co., has announced the appointment of Jack W. Harris as sales engineer in charge of valve sales for process industries and general industrial applications. These nonlubricated valves will be marketed nationally through Beaumont Iron and Alco Products Division offices.

Harris' extensive background in the design and sales of specialized valves with Cameron Iron Works, Inc., as well as experience as a pressure-still foreman for Gulf Refining Co. and as an operating department head at J. S. Abercrombie Co. and Harrison Oil Co. aviation-gasoline plant, highly equip him for this work.

Lane-Wells Opens New Canadian Sales Office

Lane-Wells Canadian Co. has opened a new sales office in Regina, Sask., Canada. Ray E. Benjamin, well-known geologist, is in charge of this new Lane-Wells office.

Western Co. Establishes New Technical Service Station

A new technical oil-well service station has been opened at Healdton, Okla., by Western Co., Midland, Tex., it has been announced by H. E. Chiles, Jr., president. Western will offer in the new area its complete line of services and products including fracturing, acidizing, jet and bullet perforating, and radioactivity well logging.

Cy V. Helm has been designated manager of the new district. He will be assisted by Charles Pannill as field

Now available in quantity production

Here is a high molybdenum silicon alloy steel drilling bit that will cut its way through the hardest formations faster, at less cost per foot, and with fewer dressings, than the conventional carbon steel bit used in ordinary drilling practice. The SPANG MOLLOY BIT is a *special* alloy bit, completely heat treated, with higher strength in the blade section and greater pin strength. Because of its deep penetrating hardness, it resists abrasion and battering under the severest drilling conditions. Its use is recommended where ordinary bits are ineffective.

Unlike most high alloy bits, SPANG MOLLOY BITS can be field dressed and tempered by following practices similar to those for carbon steel bits.

When you encounter formations that slow you down and skyrocket costs, ask your Dealer for SPANG MOLLOY BITS—"The Red Bit with the Yellow Collar."

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supervisor. The district is part of Western's North Texas - Oklahoma region which includes service installations at Borger, Tex., Ulysses, Kans., Guymon, Okla., and the new station at Healdton.

Regional headquarters are at Wichita Falls under the supervision of C. E. (Spike) Inman.

W. W. (Bill) Wilson, assistant sales manager, and L. O. (Red) Gore, field salesman, will handle the sales assignments in the new district. Gore, who previously supervised sales in the Panhandle area, will now maintain his headquarters in Ardmore, Okla.

Baash-Ross Names Messinger District Sales Manager

E. M. Gearke, general sales manager for Baash-Ross Tool Co., has announce the promotion of Hal Messinger to California district sales manager for the Baash-Ross organization.

Messinger operated for a number of years as Baash-Ross sales representative in the Los Angeles basin area, Ventura, and San Joaquin Valley, Calif.

In another company release, J. L. Barnett, Baash-Ross district sales manager for West Texas and New Mexico, announced the addition of Harold Whitely to the sales operations of the company's Odessa-Midland, Tex., organization.

Whitely is familiar with field operations in this area, having worked in

HAL MESSINGER

H. WHITELY

the West Texas fields with several drilling contractors for a number of years, as well as in sales and service work for oil-tool supply organizations. Whitely will make his headquarters at Odessa.

L-K Pump Names Hugghins To Executive Position

L-K Pump Valve Co. of Houston has announced the appointment of J. H. Hugghins to the position of purchasing agent and advertising manager. Hugghins has represented the company in sales engineering since 1946. Hugghins attended Tulane University and graduated from the University of Houston with a mechanical engineering degree.

Harley Sales Co. Awards Engine at Russell Show

D. C. Russell, manager of Kaw Pipeline Co., is shown drawing the winning number on a Wisconsin engine which was awarded by Harley Sales Co. at the recent Russell Oil Show in Russell, Kans. Looking on as Russell makes the drawing are Bob Neal, sales manager of Harley Sales, and Russ Pride, manager of the Wichita store of Harley Sales.

RED DEVIL

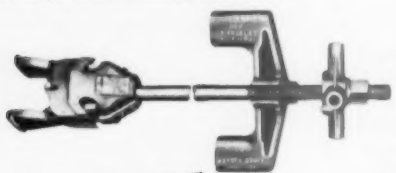
"DIA-HARD" Slush Pump Liners

High Hardness and High Carbon The Combination for Longer Life

Maximum wear resistance results from the combination of *high hardness* and *high carbon*, not from high hardness alone. The deep wear resistant case of Red Devil "Dia-Hard" liners has a uniform *hardness* of 62-64 Rockwell "C" and a uniform *high carbon* content in excess of 1.00%. This combination of a case of high hardness and abrasive resistant carbides with a core of high tensile strength and ductility is obtainable only by our special "Dia-Hard" process.

Integrally forged liner glands; precision honed bore. Outside dimensions are accurately machined assuring perfect working fits with liner packing assembly and pump cylinder for positive sealing against modern high pressure pump operation.

Write for Price Catalog No. P-120.



LINER PULLERS

The Red Devil Liner Puller is a strong, heavy duty tool capable of pulling the most obstinate liner. Simple in operation, there are no pins, connecting links or other small parts to bend, shear, break or lose. Two Types: "Universal Type" (as illustrated) for slush pumps, the "Expanding Grip Type" for pulling thin wall tube-type liners in small pumps. *Write for Price Catalog No. P-122.*

TELL-TALE LINER PACKING ASSEMBLIES

Give warning before pump damage

Tell-Tale Liner Packing Assembly consists of two "Dia-Tex" oil and heat resistant sealing rings separated by a precision machined corrosion-resistant steel lantern ring. Internal leakage is detected instantly through the tell-tale hole before costly fluid cuts can damage the slush pump. For information on Red Devil Tell-Tale Packing Assembly or "Dia-Tex" Liner Sealing Rings *write for Price Catalog No. P-121.*

Consult Composite Catalog

for full information on Red Devil Products or write for price catalogs. Red Devil Products are available through your supply store.

Oil Well Manufacturing Corp.

6000 S. ALAMEDA STREET, LOS ANGELES 1, CALIFORNIA

Duffy Is Appointed District Sales Manager

B. K. DUFFY

Harold D. Skyrm, vice president, General American Transportation Corp., Chicago, recently announced the opening of a southern California sales office for the company's plate and welding division and the appointment of Ben King Duffy as district sales manager.

Skyrm also announced that a field erection shop is being constructed at Colton, Calif., to facilitate erection of Wiggins floating roofs and Wiggins conservation structures throughout the territory.

Duffy, who for the past 4 years has been plate and welding division sales manager at Pittsburgh, Pa., has been with General American since 1946 and was originally with the process-equipment division in New York.

E. D. Rollins, western sales manager, with offices in San Francisco, will supervise the entire West Coast operation.

Minneapolis-Honeywell Opens New Dallas Office

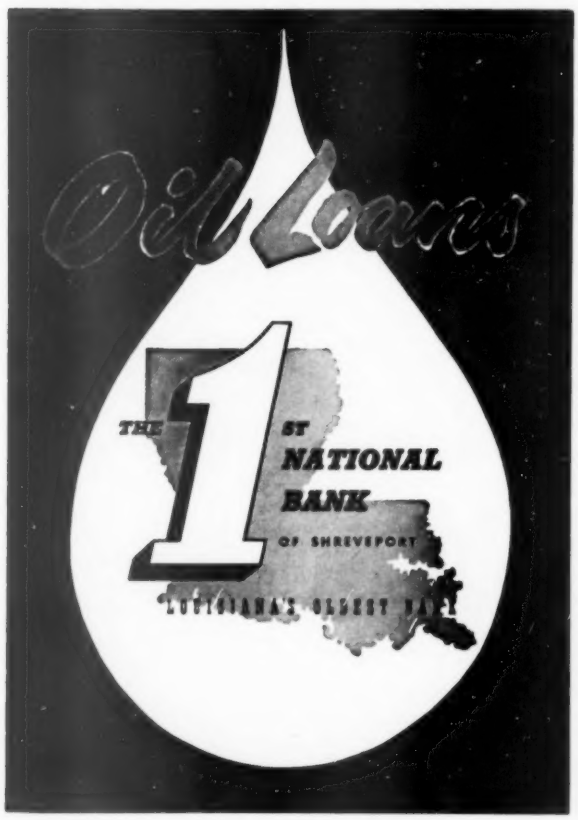
Minneapolis-Honeywell Regulator Co. has opened a new 13,000-sq. ft. sales office and warehouse in Dallas, which will house the company's southwestern regional office which serves Texas, Oklahoma, Kansas, and parts of Louisiana, Mississippi, Arkansas, Missouri, and New Mexico. It will also be headquarters for Honeywell's branch sales office serving northern Texas, and northern Louisiana.

Instruments, Inc., Named Penetron Manufacturer

O. W. GRAHAM

Negotiations have been completed between O. W. Graham, president of Instruments, Inc., Tulsa, and C. F. Teichmann, vice president and manager of Texaco Development Corp., New York, granting Instruments, Inc., the manufacturing rights of the Penetron instrument. Considerable research and development was carried out by The Texas Co. pertaining to this instrument and it was originally developed by O. W. Graham under the direction of G. Herzog for The Texas Co.

The RAD-O-THIK, trade name for the Penetron, is an instrument designed to measure the wall thickness of pipe without access to the inside of the pipe and without removing the pipe from service. The RAD-O-THIK functions by measuring the amount of absorption caused by placing the pipe in the path between the gamma ray source and a Geiger-Mueller counter tube.



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Demco's exclusive finishing process provides a mirror-smooth, abrasive-resistant surface to reduce friction—lengthening life of both wash pipe and packing. These wash pipes, of special alloy steel, are uniformly heat treated inside and outside, for maximum hardness and precision machined!
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Pipe-Line Construction

PIPE-LINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipe-line companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the company name.

Crude-Oil Pipe Lines

• **California - Oregon Pipe Line System**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

R. A. Goodall.—45 miles, 6-in., under way, Little Beaver to Merino, Colo. (To connect with Sterling system).

• **Gulf Refining Co.**—55 miles, 12-in., planned. Bay Marchand to Plaquemines, La.

Gulf Refining Co.—63 miles, 8-10-in., under way, Lea County, New Mexico, to Anderson and Denton fields. 1-54.

Lakehead Pipe Line Co.—635 miles, 30-in., under way, Superior, Wis., to Sarnia, Ontario, Canada. Project managed by Bechtel Corp., Saginaw, Mich.

Superior to Wisconsin-Michigan state line. Mahoney Contr.

Mackinaw City to Red Oak, Mich. Bechtel Corp.

Red Oak via Bay City to International Boundary south of Port Huron on St. Clair River. Conyes Const.

Water crossings of Mackinaw, Saginaw, and St. Clair rivers, Merritt-Chapman & Scott Corp., W. J. Meagher & Sons, Inc., and Midwestern Constructors.

• **Magnolia Pipe Line Co.**—29 miles, 8-in., planned. Midland County, Texas area.

Magnolia Pipe Line Co.—154 miles 16-in., under way, Corsicana to Ringgold, Tex. H. B. Zachry. Completion date 11-15-53.

Michi, Inc.—10-in., planned, Highland, Ind. to Kalamazoo, Alma, and Elsie, Mich.

• **Pasotex Pipe Line Co.**—146 miles, 10-in., planned. Snyder to Wink, Tex. 2-1-54.

Phillips Pipe Line Co.—18 miles, under way, gathering lines, northeast area of Andrews County, Texas.

• **Progress Pacific Pipeline Co.**—1,100 miles, 24-in., planned, Odessa, Tex., to Los Angeles, Harbor, Calif.

• **Roosevelt Oil & Refining Corp.**—22 miles, 4 and 6-in., planned St. Helen to Norwich, Mich.

Service Pipe Line Co.—153 miles, 12-16-in., under way, Tioga-Beaver Lodge area to Mandan, N. D. O. R. Burden Const. Corp. Completion date 12-1-53.

55 miles, 4-6-8-in., under way, Tioga-Beaver Lodge area gathering system. C. P. Bartley & Son.

Texas New Mexico Pipe Line Co.—52 miles, 10-in., contracted, Dawson County to Basin System, McVean & Barlow.

Texas Pipe Line Co.—34 miles, 6-in., under way, Sour Lake to Port Arthur, Tex. Houston Contracting.

45 miles, 8-10-in., under way, between Erath and Bayou Sale stations. Houston Contracting Co.

65 miles, 4-6-8-12-in., under way, South Louisiana. Panama-Williams.

Golden Meadow to Houma, La. Panama-Williams.

Gathering lines in Leeville, Bay De Chene and Golden Meadow pools. Panama-Williams.

• **West Coast Pipeline Co.**—960 miles, 20-22-in., planned, Wink, Tex., to Norwalk, Calif.

Products Pipe Lines

Augusta Pipe Line Co.—43 miles, 8-in., under way, from Arkansas City to Augusta, Kans. Ray L. Smith & Son, Inc.

Badger Pipe Line Co.—215 miles, 8-10-12-in., begin Spring '54, East Chicago, Ind., to Madison, Wis. (Joint project of Cities Service Oil Co., Sinclair Pipe Line Co., Pure Oil Co., and The Texas Co.

• **H. W. Bass & Sons, Inc.**—152 miles, 4-6-in., proposed. Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

• **Great Lakes Pipe Line Co.**—Proposed, extension 130 miles, Nebraska City to Grand Island, Neb.

Harbor Products Systems—86 miles, 16-in., under way, Woodbury Junction, Philadelphia to Trembley Point, N. J. Construction Service Co. and H. C. Price Co. (Joint ownership of Sinclair Pipe Line Co., Gulf Refining Co., and Texas Pipe Line Co.)

Kaneb Pipe Line Co.—246 miles, 8 and 10-in., under way, Wichita, Kans., to Fairmont, Neb. Ray L. Smith & Son, Inc.

• **Phillips Petroleum Co.**—54 miles, 6-in., planned, Goldsmith to Borger, Tex.

45 miles, 10-in., under way, Harrisonville, Mo. Mid States.

52 miles, 10-in., planned, Shell's Brookshire system to Sweeny, Tex.

• **Salt Lake Pipe Line Co.**—40 miles, 6-in., under way, Adams, Ore., to Pasco, Wash. Engineers, Ltd., P. L. Co.

Standard Oil Co. (Ind.)—243 miles, 10-12 in., under way, Whiting, Ind. to River Rouge, Mich.

Calumet district, Indiana, Morrison Construction Co.

Lake County, Indiana boundary to Colon, Mich., Somerville Construction Co.

Colon to Romulus, Mich. R. B. Potashnick.

Romulus to River Rouge, Mich. R. L. Coolsaet Construction Co.

205 miles, 10-in., under way, Mandan, N. D. to Moorhead, Minn. Associated Pipe Line Contrs. 12-53.

Sunray Oil Corp.—440 miles, 10-in., contracted, Duncan, Okla., to Mississippi River. Ford, Bacon & Davis. Williams Bros.

• **Triangle Pipe Line Co.**—560 miles, proposed, Arkansas City, Ark., to Covington, Ky., and Nashville, Tenn.

• **United States Pipe Line Co.**—1,799 miles, 22-26-in., proposed, Beaumont, Tex., to Newark, N. J.

Beaumont, Tex., to Memphis, Tenn.

Memphis, Tenn., to Louisville, Ky.

Louisville, Ky., to Newark, N. J.

Laterals to Paducah and Lexington, Ky.

Warren Petroleum Co.—34 miles, 4-in., under way, Lea County, New Mexico. Western Const. Completion date 11-53.

• **Williston Basin Pipe Line Co.**—244 miles, 8-in., proposed, Laurel-Billings, Mont., refineries to Glendive, Mont.

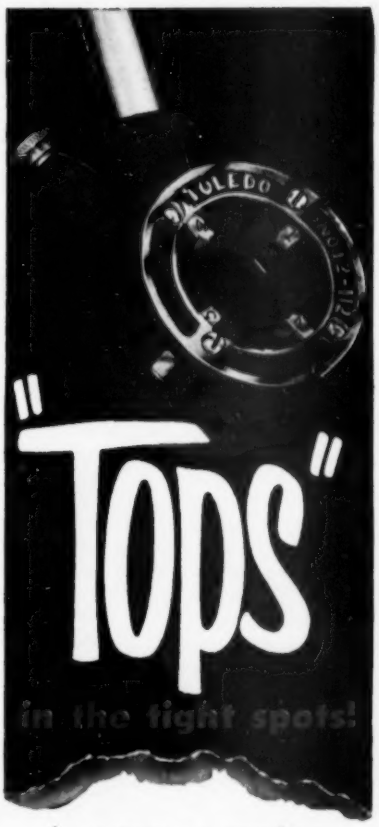
Wolverine Pipe Line System—200 miles, 14-in., under way, Chicago-Toledo-Detroit. (Joint ownership of Shell, Texas, and Cities Service.) Anderson Bros. and Midwestern Constructors, Inc. Completion date 1-54.

East Chicago, Ind. to Kalamazoo River, Midwestern Constructors, Inc.

Yellowstone Pipe Line Co.—(Continental Oil Co., Interstate Oil Pipe Line Co., Union Oil Co., and H. Earl Clack interest) 540 miles, 10-in., contracted, Billings, Mont., to Spokane, Wash. 9-54.

Billings to Bozeman, Mont. Ross and Powers.

Bozeman to Helena and on to Clinton,



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QUICK CHANGE OF SIZES. Die heads drop into ratchet from either side held securely.

DIES OF FINEST TOOL STEEL. Precision-ground. Die segments can be reground when dull or replaced at small expense. Three models: No. 00—⅛" to ¾"; No. 11—¼" to 1¼"; No. 12—½" to 2" pipe.

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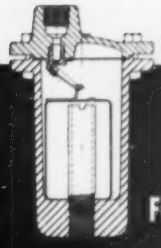

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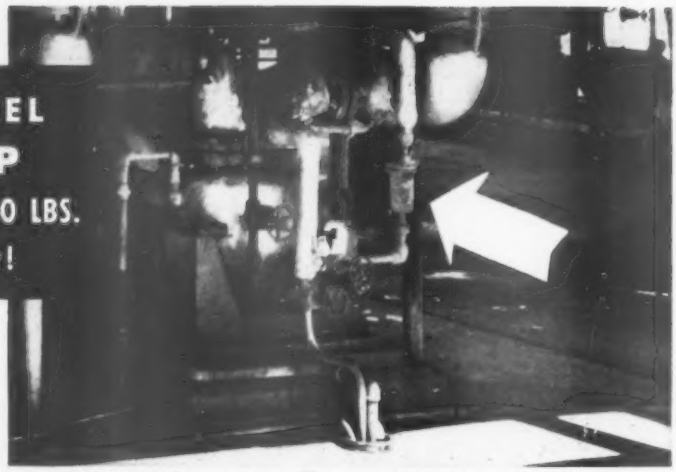

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No. 3211 Vital Statistics

Pipe Connections	½" or ¾"
Max. Pressure	250 lbs.
Capacity	760 to 1060 lbs/hr
Height	7"
Weight	8 lbs.
Body and Cap	forged steel
Valve and Seat	chrome steel
Interior trim	stainless steel

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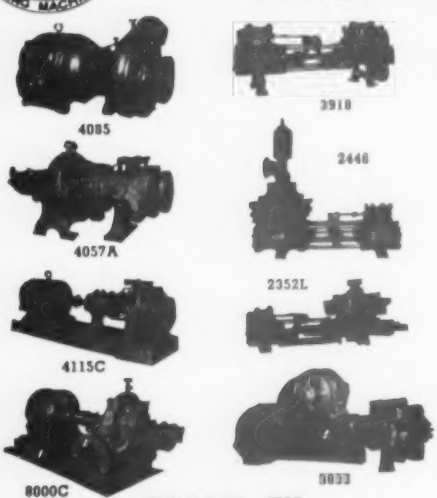

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Clinton to Perma, Mont. Associated Pipe Line Contractors, Inc.

Clinton to Perma, Mont. Eastern Pipe Line Fields Service Co.

Perma, Mont., to Murray, Idaho. Eastern Pipe Line Field Service Co.

Murray, Idaho to Spokane, Wash. Engrs. Limited Pipe Line Co.

Natural-Gas Pipe Lines

• **America-Louisiana Pipe Line Co.**—1,000 miles, 30-in., proposed, Lowry, La., to Detroit, Mich.

• **Arkansas-Missouri Power Co.** — 140 miles, 2 to 10-in., planned, St. Francis River, Clay County, Arkansas, to near Campbell, Mo.

• **Associated Natural Gas Co.**—88 miles, proposed, Missouri.

• **Atlantic Seaboard Corp.**—29 miles, 26-in., proposed, looping along Cobb-Rockville, Md., line.

Buzzards Bay Gas Co.—28 miles, 8-in., contracted, Hyannis, Mass., to Bourne Bridge, Mass. Hallen Co., Inc.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

• **Chattahoochee Natural Gas Co.**—70 miles, proposed, Floyd County, Georgia to Dalton, Ga.

• **Chicago District Pipe Line Co.**—31 miles, 24-30-in., proposed, East bank of Des Plaines River southwesterly to near Hodgkins, Ill., on through Cook County to Will County, Illinois.

• **Cities Service Gas Co.**—18 miles, 16-in., Lawrence and Newton counties, Missouri.

69 miles, 20-16-in., planned, Cleveland, McClain, and Garvin counties, Oklahoma.

• **City of Fayette, Ala.**—20 miles, 5-in., proposed, Fayette, Ala., to Southern Natural's system in Tuscaloosa County, Ala.

City of Dallas, Ga.—8 and 4½-in., distribution system. Engineering & Const. Co., 1954.

• **Coast Counties Gas & Electric Co.**—40 miles, 3, 4, and 8-in., planned. Coast and Valley region, California.

• **Colorado Interstate Gas Co.**—365 miles, 22-in., proposed, Green River, Wyo., to Denver, Colo. 1954.

243 miles, 4 to 20-in., planned, Colorado, Oklahoma, Texas, and Kansas.

50 miles, 20-in., under way, Hugo to Eads, Colo. R. H. Fulton.

Colorado Interstate Gas Co. — 70 miles, 20-4-in., under way, gas-gathering system in Kansas. Engineering & Const. Co. 1-1-54.

• **Cumberland and Allegheny Gas Co.**—31 miles, 12-in., proposed, Garrett County, Md., to Keyser, W. Va.

East Tennessee Natural Gas Co.—96 miles, 16-in., under way, Knoxville, Tenn., to Kent line. Engineering & Const. Co. 1-1-54.

54 miles, 4-12-in., under way, laterals off main line from Knoxville, Tenn., to Kent line. Engineering & Const. Co. 1-1-54.

• **El Paso Natural Gas Co.**—1,178 miles, proposed, Permian basin, New Mexico, Texas and Colorado.

El Paso Natural Gas Co.—771 miles, 30-in., under way, Plains, Tex. to Kingman, Ariz. 567 miles contracted by Oklahoma Pipe Line Constructors, R. H. Fulton and Co. and Western Pipe Line Contractors. 204 miles to be built by El Paso Natural construction organization.

Under way, Flagstaff to Kingman, Ariz., Western Pipe Line Const., Inc. 2-54.

Under way, Denver City, to Corona, N. M. Okla. Pipe Line Constructors, Inc. 12-15-53.

• **Fort Worth Basin Gas Co.**—Planned, Novice, through Brown and Comanche counties, Texas.

• **Glacier Gas Co.**—285 miles, 20-in., proposed, Kalispell, Mont., to Spokane, Wash.

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For the convenience of PLS customers, pipe can be shipped from eastern mills on *through rates* to destinations west, northwest and southwest . . . with a stop-over privilege for cleaning, priming, coating and wrapping—at our plants in Franklin Park, Illinois, and Longview, Texas. It's another feature of the complete, dependable service you can count on at PLS.

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Dependable Service Since 1931

120 miles, 16-in., proposed, Spokane to Hanford, Wash.

91 miles, 8⅝-in., proposed, Spokane to Lewiston, Idaho.

130 miles, 12¾-in., proposed, Spokane to International boundary at Trail, British Columbia.

Gulf Interstate Gas Co.—860 miles, 30-in., under way. Acadia Parish, La., to Boyd County, Ky. H. C. Price and Houston Contracting. 11-54.

Under way, Rayne, La. to Kincade, Tenn. Houston Contr.

Under way, Gordonsburg, Tenn., to Catlettsburg, Ky. H. C. Price Co.

230 miles, gathering lines, under way. Associated Pipe Line Contractors, Anderson Bros., Williams Bros.

329 miles, 12 to 24-in., proposed. Laterals off Acadia Parish, Louisiana, to Boyd County, Kentucky, line.

• **Home Gas Co.**—32 miles, 12-in., planned. Breesport to Union Center, N. Y.

17 miles, 12-in., proposed, loops from Hansock to Sanford, N. M.

Home Gas Co.—46 miles, 12-in., under way, Tioga and Broome counties, New York. H. L. Gentry Const.

22 miles, 12-16-in., under way, Binghampton, N. Y.

• **Interstate Power Co.**—26 miles, 8-in., proposed, from Nat. Gas P. L. Co. America line near Hooppole, Ill., to Clinton, Ia.

Iowa-Illinois Gas & Electric Co.—41 miles, 10-in., under way, Washington County to Cedar Rapids, Iowa.

• **Kansas-Nebraska Natural Gas Co.**—41 miles, 10-12-in., proposed, Kansas and Nebraska.

41 miles, proposed, Albion, Arcadia, and Broken Bow, Neb.

Kansas-Nebraska Natural Gas Co.—32 miles, 8-12-in., under way, Devel County, Nebraska, to Logan County, Colorado. M & R Const. Co. Completion date 11-15-53.

18 miles, 16-in., Palco to Hill City, Kans. Completion date 11-15-53.

• **Lone Star Gas Co.**—100 miles, proposed, storage fields to the Dallas-Fort Worth area.

35 miles, 12-in., proposed, southeastern Schleicher County.

36 miles, 12-in., planned, Stamford to Abilene, Tex.

Lone Star Gas Co.—44 miles, 12-in., under way, Red Springs, Woods County to Sulphur Springs area, Hopkins County, Texas.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington, and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., proposed, Doddridge, Wetzel and Marshall counties, West Virginia.

Michigan Consolidated Gas Co.—30 miles, 12-20-24-in., under way, gas gathering system in Six Lakes field. Somerville Const. Co. 11-1-53.

• **Mississippi River Fuel Corp.**—109 miles, 10-18-in., planned, laterals in Woodlawn and Waskom gas fields, Texas.

Missouri Central Gas Co.—25 miles, 6-in., contracted, Moberly to Macon, Mo. L. R. Young Const. Co.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo.

• **Montana Power Co.**—52 miles, 16-in., planned, Canada-Montana border to Cut Bank, Mont.

• **Morganfield Natural Gas Co.**—31 miles, 4-6-in., planned, through Sturgis, Providence, Clay, Diamond, Wheatcroft, and Sullivan, Ky.

• **Natural Gas Producer Inc.**—100 miles, 12-in., planned, Yenter pool to Denver, Colo.

• **Nevada Natural Gas Pipe Line Co.**—114 miles, 12¾-in., proposed, Topock, Ariz., to Las Vegas, Nev.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **Northeastern Gas Transmission Co.**—22 miles, 8-in., planned, Upton, Mass., to Pawtucket, R. I.

• **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

• **Northern Natural Gas Co.**—458 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska, Iowa and Minnesota to connect with Permian Basin System.

475 miles, proposed branch lines to Iowa, Nebraska, Minnesota and South Dakota.

Northern Natural Gas Co.—Section No. 1, 92 miles, 30-in., under way, Dumas via Sunray to main line north of Canadian River, Texas, and two loops near Beaver station, Oklahoma, R. H. Fulton & Co.

Northern Natural Gas Co.—Section 2, 70 miles, 30-in., contracted, loops near Mullinville, Bushton and Clifton stations, Kans., and Palmyra station, Neb. Lone Star Constructors.

Northern Natural Gas Co.—Section 3, 94 miles, 24-in., and 30-in., contracted loops near Paulina, Ogden, and Oakland stations, Iowa, G. G. Griffis Construction Co.

• **Northwest Alabama Gas District**—40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

• **Northwest Natural Gas Co.**—750 miles, planned, Washington, Oregon, and Idaho.

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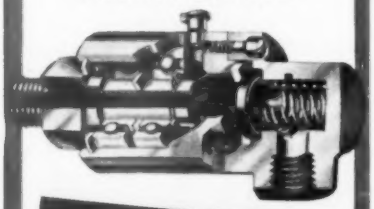

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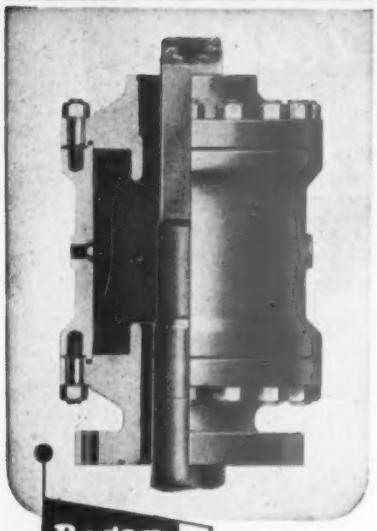

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18-in., Monroe to International boundary near Lynden, Wash.
22-in., Monroe to near Seattle, Wash.
20-in., Seattle to Portland, Ore.

• **Ohio Fuel Gas Co.**—31 miles, 20-in., planned, Licking County to Richland County, Ohio.
22 miles, 16-in., planned, Dayton, Troy, Piqua, and Sidney, Ohio.
23 miles, 16-20-in., planned, Wellington to Elyria, Ohio; 16 miles, 20-in., planned, Benton Station to Crawford Station; 18 miles, 20-in., Crawford Station to near Columbus; 16 miles, 16-in., planned, Berlin to Sandusky, Ohio.
74 miles, 3 to 20-in., planned, Hocking, Knox, and Ashland counties, Ohio.
47 miles, 20-in., planned, Benton Township, Hocking County, to Columbus, Ohio.
61 miles, planned, northern and southwestern Ohio.
33 miles, 20-in., proposed, Jefferson to Seneca, Ohio.
69 miles, 20-24-in., proposed, lines to tiein Gulf Interstate line along various points in Lawrence, Jackson, Vinton, Hocking and Fairfield counties, Ohio.

• **Pacific Gas & Electric Co.**—50 miles, 12-16-20-in., planned, Fresno to Merced, Calif.
(Section 2) 20-in., Holm to Topock-Milpitas line.
(Section 3) 12-in., parallel existing Madera-Livingston line, planned. Napa Wye to Shellville; Cotati to Santa Rosa, Calif.
170 miles, 34-in., proposed, main-line loops along Topock, Ariz., to Milpitas, Calif.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash.
380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

Permian Basin Pipeline Co.—280 miles, 16-24-26-30-in., under way, West Texas and New Mexico. R. H. Fulton & Co.

• **Rockland Light & Power Co.**—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

• **Shenandoah Gas Co.**—39 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va.

South Carolina Gas & Electric Co.—160 miles, 16-12-10-in., contracted, Aiken, S. C., to cities of Columbia, Summerville, and Charleston, S. C. Williams Bros. Completion date 1-54.

• **South Georgia Natural Gas Co.**—339 miles, 2-12-in., planned, Phoenix, Alta., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee.

Southern California Gas Co., and Southern Counties Gas Co.—73 miles, 30-in., under way, loops on main line from Blythe to Los Angeles. River Const. Co. 1-54.

Southern Natural Gas Co.—1,235 miles, 24 to 4½-in., under way, Louisiana, Mississippi, Alabama, and Georgia, and South Carolina. Houston Contracting, Latex and H. C. Price. Fall 1953.
Wrens, Ga., to Savannah, Ga. Houston and Latex of Georgia. Completion date 11-1-53.
Rockmart, Ga., to Rome, Ga. Latex of Georgia. 11-1-53.
Elmore, Ala., to Tallahassee, Ala. Houston Contr. Completion date 12-1-53.
Miscellaneous lines in South Louisiana. Houston and Brown and Root. Completion date 11-15-53.
Gwinville to Pickens. Completion in 1954.
Gwinville, Miss., to Ellerslie, Ga. Completion in 1954.
Thomaston, Ga. Completion date 11-53.
Sanderville, Ga., lateral. Completion date 12-1-53.

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• **Southwest Gas Corp., Ltd.**—26 miles, proposed, from P.G.&E. line to Victorville, Calif.

Tennessee Gas Transmission Co. — 571 miles, 30-in., planned, Kinder, La., to Portland, Tenn.

67 miles, 30-in., planned, loops in Texas and Louisiana.

63 miles, 26-in., planned, loops in Ohio and Pennsylvania.

58 miles, 20-in., planned, Louisiana Gulf Coast to Station No. 507 near Kinder, La.

100 miles, laterals in Texas.

45 miles, 20-in., proposed, Buffalo, N. Y., to the U. S.-Canadian border Hamburg station near St. Catherines.

Texas-Illinois Natural Gas Pipe Line Co.—65 miles, various, under way, vicinity of Victoria and Houston, Tex. O. R. Burden Const. Co. 11-10-53.

• **Texas-Ohio Gas Co.**—1,435 miles, 30-in., proposed, Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va.

• **Trans-Northwest Gas, Inc.**—246 miles, proposed, International Boundary near Osoyoos, B. C., to Washington and Idaho.

275 miles, branch lines.

• **United Gas Fuel Co., and Central Kentucky Natural Gas Co.**—92 miles proposed, Gulf Interstate system, Boyd County, Ky., to Putnam County, West Virginia.

• **United Fuel Gas Co.**—50 miles, 20-24-in., proposed, Wood County to Lanham, W. Va. Spring 1954.

32 miles, 24-in., proposed, near Ripley, W. Va., to Lanham station, Putnam County, W. Va.

60 miles, 30-in., proposed, Lanham in Kanawha County, West Virginia, to Gulf Interstate line in Boyd County, Ky.

United Gas Pipe Line Co.—44 miles, 20-in., under way, Lirette field to Harvey, La. Brown & Root.

• **United Natural Gas Co.**—50 miles, 12-in., planned, Elk County to Jefferson County, Pennsylvania.

• **Utah Natural Gas Co.**—103 miles, 16-18-in., proposed, Clear Creek field near Price to Salt Lake City, Utah.

18-in., Clear Creek to Provo, Utah.

16-in., Provo to Salt Lake City, Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Warren Petroleum Co.—54 miles, 4-30-in., planned, Lea County, New Mexico.

25 miles, 3 to 20-in., Garvin County, Oklahoma. Completion date 6-54.

Westcoast Transmission Co., Ltd. — (See foreign natural gas pipe lines).

Foreign Crude-Oil Pipe Lines

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products.)

• **Creole Petroleum Corp.**—25 miles, 34-in., planned, Lagunillas to La Salina (State of Zulia, Venezuela.)

Direccion General de Yacimientos Petroliferos Fiscales—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

• **Gaz de France**—200 miles, 12-in. Ruhr to Paris, France.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Petroleos Mexicanos.—125 miles, 10-in., under way, Jose Colomo to El Plan, Mexico.

• **Saskatoon Pipe Line, Ltd.**—56 miles, 6-in., planned, Milden to Saskatoon, Sask.

Texas Petroleum Co. — 60 miles, 4-6-in., under way, Pta. Nino to La Dorada.

• **Trans Mountain Oil Pipe Line Co.**—30 miles, planned, Vancouver, B. C., terminal to Ferndale, Wash.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Foreign Products Pipe Lines

Columbian Ministry of Petroleum—115 miles, 4-in., under way, La Dorado to Cartago, Colombia, Williams Bros. Engineers.

93 miles, 8-in., under way, Cantimplora to Dorado, Colombia, William Bros. Constructors.

• **Empresa Nacional del Petroleo** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

North Atlantic Treaty Organization (NATO)—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line.) Contracted by Soc. Foster Wheeler Francaise.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

• **United States and Canadian Governments**—600 miles, 8-in., planned, Haines to Fairbanks, Alaska.

Foreign Natural-Gas Pipe Lines

Azienda Generale Italiana Petroli.—110 miles, 12-14-16-in., under way, Cortemaggiore to Genoa. Completion date 11-53.

Azienda Generale Italiana Petroli — 90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

Direccion General del Gas del Estado—310 miles, 8-in., under way, Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.

• **Empresa Nacional del Petroleo** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

• **Mid-Continent Pipelines, Ltd.** — 1,860 miles, 30-in., proposed, Alberta to Montreal, Canada. Fish Engineering Co.

• **Northwest Natural Gas Co.**—950 miles, 24-in., planned, Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.

Petroleos Mexicanos. — 205 miles, 16-in., under way, Monterrey to Torreon, Mexico

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

• **Trans-Canada Pipe Lines, Ltd. (Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in., proposed, Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

• **Westcoast Transmission Co., Ltd.**—1,110 miles, 24-in., planned, Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland. Ford, Bacon & Davis, engineers.

280 miles, 20-in.; planned, Pincher Creek to Montana on to Spokane, Wash. Ford, Bacon & Davis, engineers.

138 miles, 20-in., planned, Sumas to Tacoma, Wash.

139 miles, 18-in., planned, Tacoma, Wash., to Portland, Ore.

• **Western Pipe Lines.**—833 miles, 24-in., proposed, from southern Alberta, eastward across the Canadian prairies, serving principal towns and cities along the route.

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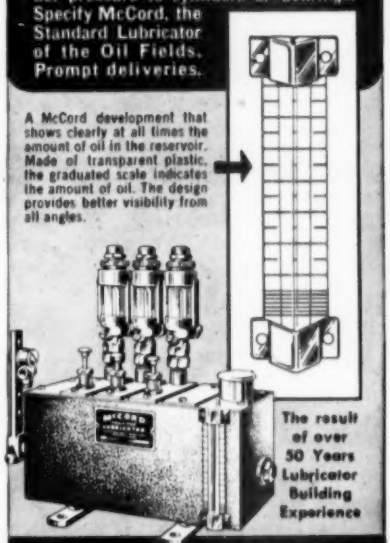

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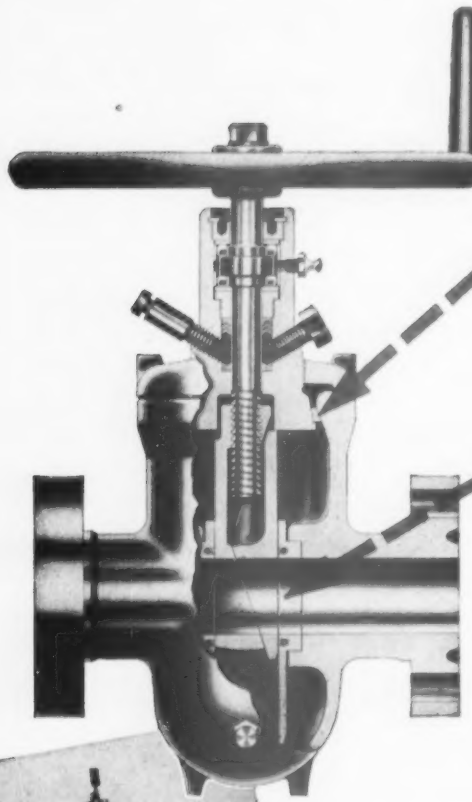

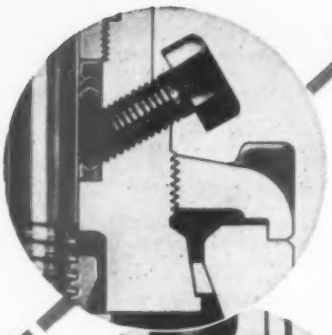

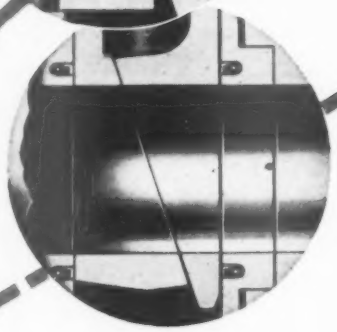

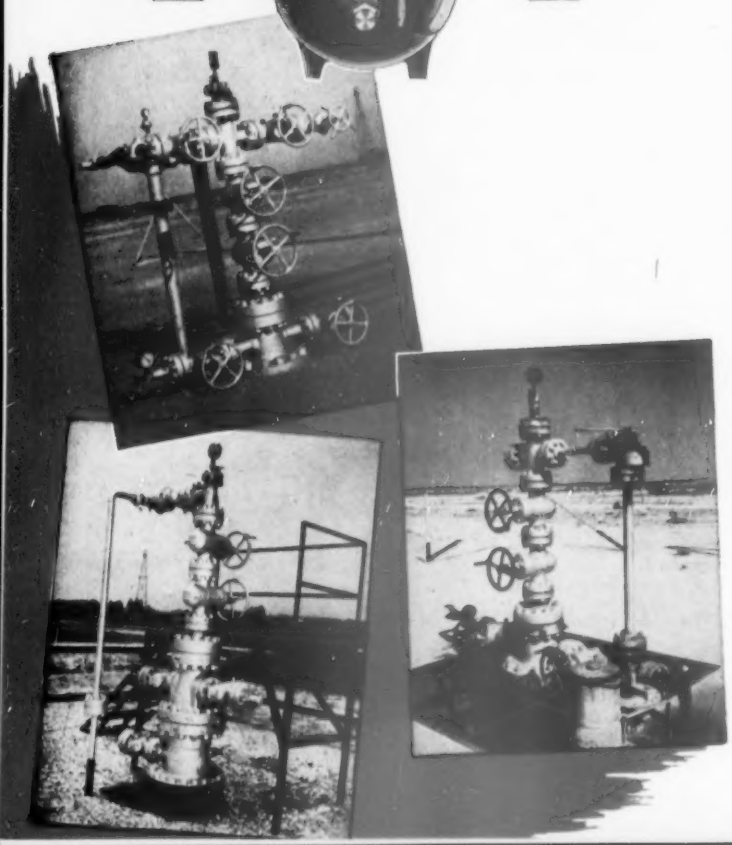

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1 FOXBORO DIAL THERMOMETERS is a new 16-page bulletin, 467, describing dial thermometers for long distance measurement. Emphasizing the variety of ranges, and the bulbs, tubing and accessories available, bulletin provides complete data on temperature indicators of vapor-pressure and gas-pressure types. Separate section gives details of construction, helpful in understanding precision performance of the instrument. Discussed in detail is the ball and trough movement which, by eliminating all connecting links, avoids loss of motion, either up or down the temperature scale. *The Foxboro Co.*

2 OAKITE COMPOUND NO. 88, a service report, covers the description, advantages, and applications of the versatile cleaning material that has proved effective in cleaning petroleum-processing equipment. Based on work done with the material in cleaning towers and heat exchangers in major refineries, the report gives concentrations, temperatures, and tank and circulation methods of applying Compound No. 88 solution to remove soils with varying characteristics. *Oakite Products, Inc.*

3 EASTMAN SERVICE. Detailed information describing laboratory services offered to those interested in Eastman's line of industrial chemicals and gasoline additives is contained in a new 20-page brochure. Liberally illustrated with photographs of a number of individual laboratories and equipment, booklet describes various tests which can be conducted and products which can be analyzed. Brochure is organized into seven sections, each section devoted to the specific services available in the protective coating, miscellaneous chemical, gasoline, physical testing, and polymer laboratories. *Eastman Chemical Products, Inc.*

4 CORROSION RESISTANT CEMENT LINING OF STEEL PIPE AND FITTINGS. A four-page bulletin describes a new cement-lining process for steel pipe and fittings offered by a new company. The new method involves accurate control of weight and content of analyzed materials resulting in a strong, smooth, and uniform finish. *Mid-West Cement Pipe Lining Co., Inc.*

5 HEAVY DUTY PROTECTIVE COATINGS BLOCK CORROSION is a new pamphlet illustrating the many important uses of three heavy-duty protective coatings: Nox-Rust Aluminum, which prevents rust, completely sheds water, reflects heat, and insulates; No-Temp, quick-drying, lightweight mastic coating which prevents rust, deadens sound, and insulates against heat and cold, and Nox-Rust 98 for buildings, bridges, ocean freighters, and other applications, wherever corrosion conditions are especially severe. *Nox-Rust Chemical Corp.*

6 MULTI-CLEAN FLOOR LIQUIDS CHART gives complete coverage specifications and other important data on 15 Multi-Clean floor finishes. The chart is so arranged as to indicate at a glance the various treatments recommended for a dozen or more types of floors. In addition there is a column pointing out combinations of liquids that may be used. Drying times and product characteristics are also given. *Multi-Clean Products, Inc.*

7 WROUGHT IRON NIPPLES is the title of a folder-type bulletin

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THE OIL AND GAS JOURNAL
BOX 1260
TULSA, OKLAHOMA

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Corresponding to new equipment items or trade literature abstracts in the Oil and Gas Equipment Digest of The Oil and Gas Journal, Oct. 19, 1953

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prepared to help technicians complete wrought-iron piping specifications. The new bulletin explains how to identify wrought-iron nipples and contains a full page of size and dimensional data. Separate tables list stock sizes and lengths in inches of standard-weight and extra-strong nipples. Listings include nominal size, close nipples, special-short, short, long, and extra-long lengths of both black and galvanized nipples. *A. M. Byers Co.*

8 OIL-IMMERSED STARTERS. The G-E line of oil-immersed motor starters, with special emphasis on design and maintenance, is described in a new two-color publication. Designated as GEA-3541, the eight-page bulletin uses more than 200 photographs and cutaway drawings to illustrate the equipment's maintenance and protective features. Also included are ratings and dimension diagrams. *General Electric.*

9 NEW STEAM TRAP SERVICE GUIDE. Subjects discussed are: How to install traps, testing and preventive maintenance, inspection and repair, and trouble shooting. Besides regular Armstrong repair-parts list are new tables giving parts identification by dimension, parts interchangeability, and pressure-change assembly interchangeability. Included are 10 helpful diagrams showing recommended trap hook-ups. *Armstrong Machine Works.*

10 THREADING EQUIPMENT. This catalog is available in Spanish, Portuguese, or English, and contains complete specifications for large range of Landis pipe-threading and cutting machines. *Landis Machine Co.*

11 SILICONE RUBBER PRODUCTS BULLETIN. A new eight-page bulletin describes diaphragms, gasketing, sheet packing, oil seals, rings, insulation tape, rod and valve-stem packings, and molded shapes for many industrial uses. The bulletin points out the heat-resistant and aging-resistant features of silicone rubber and gives examples of typical applications. *The Garlock Packing Co.*

12 JET CASING CUTTERS. A new four-page illustrated technical bulletin No. 601 gives a complete description of the applications and operation of jet casing cutters. It gives full details on the use of these wire-line tools in casing-recovery operations and describes outstanding jobs that have been successfully accomplished. *McCullough Tool Co.*

13 BULLETIN 237-C—MULTI-STAGE CENTRIFUGAL PUMPS describes Thrustfre 2, 3 and 4-stage pumps for heads up to 50 psi. and with capacities of from 50 to 850 g.p.m. Available in both sleeve-bearing and ball-bearing designs for boiler feeding and general power plant and industrial use, these pumps achieve inherent dynamic, hydraulic balance by a patented method. *Pennsylvania Pump & Compressor Co.*

14 NEW CONDENSED CATALOG describes wide range of steam generators, heat-recovery, and process equipment. The 20-page condensed catalog covers concisely a diversified line of eight basic arrangements of two, three, and four-drum steam generators furnished to meet a wide range of loads, pressures, and temperatures for power, process, and space heating; heat-recovery units, including fire-tube and water-tube boilers, plain-tube and cast-iron extended surface economizers; and process equipment including Dowtherm vaporizers, reaction kettles, autoclaves, heat exchangers, and liquid heaters. *Union Iron Works.*

15 RADIATORS FOR POWER UNITS AND HEAVY-DUTY VEHICLES briefly describes various types of radiator construction and materials, and application of specific cooling units to a variety of mobile and stationary types of equipment. Of special interest is a discussion on the causes and remedies for preventing pump cavitation, usually appearing in the pump impeller or the housing. Also procedures for application of accessories to prime mover, tractor, and truck power plants is discussed. The 24-page paper is filled with basic information regarding radiator cooling and other forms of coolers for use with oils, gases, air, and water. *The Young Radiator Co.*

FOR MORE INFORMATION . . . . use one of these cards.

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THE OIL AND GAS JOURNAL
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DIGEST OF NEW EQUIPMENT

IT'S NEW ✓ CHECK IT

by Dan B. Miller

16 NEW GAS LIFT VALVE is entirely casing-pressure operated and has no moving metal parts. Its only moving part is an oil and gas-resistant rubber sleeve which bends slightly to permit entry of gas into the tubing. Used in either intermittent or continuous flow, operation is determined by the gas injection rate at the surface. The valve is run in the tubing in the conventional manner with the highest pressure valve at the top. Prior to installation, the valve pressure chambers are loaded and then sealed by the cap screw. When the casing pressure exceeds the loaded pressure of the valve, the rubber sleeve is bent inward, allowing gas to flow through the inlet slots and over the sleeve. It then travels through the exit slots, over a rubber reverse check and into the tubing through flow ports. Only 10 to 15 lb. pressure increase in the casing annulus is necessary to open the valve to maximum flow port capacity. Upon reaching this pressure, the valve remains in open position until the casing pressure drops to the opening point at which time the valve snaps shut. As long as the tubing is below that of the casing, the above described operation will take place regardless of pressure existing in the tubing at instant of opening or closing. *Cummings, Inc.*

IT'S NEW ✓ CHECK IT

17 STOODY BUILD-UP. This alloy-coated electrode was developed for rebuilding carbon steel and alloy steel parts. It has sound deposits, high tensile strength, toughness, and resistance to cold flowing; in short, the exact properties necessary for materials of this classification. It is recommended as an underbase for such parts as drive sprockets, churn drills, shovel drive tumblers, tractor rollers and idlers, tool joint shoulders, and clutch jaws. Stoody Build-Up electrode produces an alloy steel deposit of consistent medium hardness of 29-31 Rockwell C under normal conditions. *Stoody Co.*

IT'S NEW ✓ CHECK IT

18 NEW N-815 IDEAL SWIVEL. Normally used for 8,000 to 15,000 ft. drilling, it is designated the N-815, in accordance with a new plan tieing the swivel nomenclature in with drilling depths. Special features include a lower center of gravity, to give greater stability in handling, a body streamlined for maximum safety, and the use of a Uniflex-pipe packing box assembly, to provide an improved method of packing off the mud. A Quick-Seal hose connection is furnished as standard equipment. The swivel has a dead-load capacity of 400 tons. It has an over-all height of 8 ft. 10½ in., including the sub, and an over-all width of 39 in. The body is a one-piece casting of electric steel. All bolts, nuts, pins, and grease fittings are recessed to eliminate any dangerous projections. The lower center of gravity facilitates making up of the swivel sub with the kelly. Wash pipe of the Uniflex assembly is of the free-floating type, remaining concentric with the packing rings as they rotate. This prevents any reaming action on the rings because of eccentricity. Quick-breaking threads facilitate replacement. The Quick-Seal hose connection consists of a nut and union member, eliminating one hose connection member. *The National Supply Co.*

IT'S NEW ✓ CHECK IT

19 SPEED AND PRESSURE GOVERNOR is for control of engine speed from suction pressure or discharge pressure of engine driven pumps and compressors. The pressure control unit of the governor is pneumatic, operating from a controller. The governing unit is a standard Massey Type HP Hydraulic Isochronous governor with proportioner control so that it is interchangeable on mounting, drive and throttle linkage with standard Massey governors. A typical application of this governor is on the engines of pipe-line stations. Engine speed is controlled through the governor in such a way that as suction pressure to the pumps increases it will speed up the engines in that station, but if discharge pressure becomes too high

KEEP INFORMED ✓SAVE TIME ✓TEAR OUT CARD ✓CHECK IT ✓MAIL IT

This Digest of New Equipment offers you a quick resume of important features of new or improved products and trade literature and the opportunity to obtain complete information on each subject by use of the convenient "CHECK IT - MAIL IT" service card.

COYNCO

HEAT TRANSFER EQUIPMENT

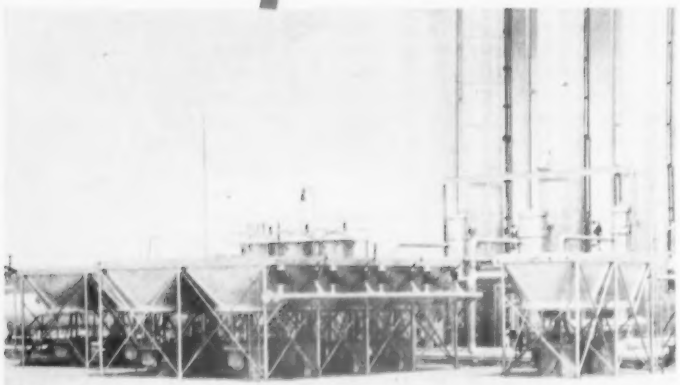
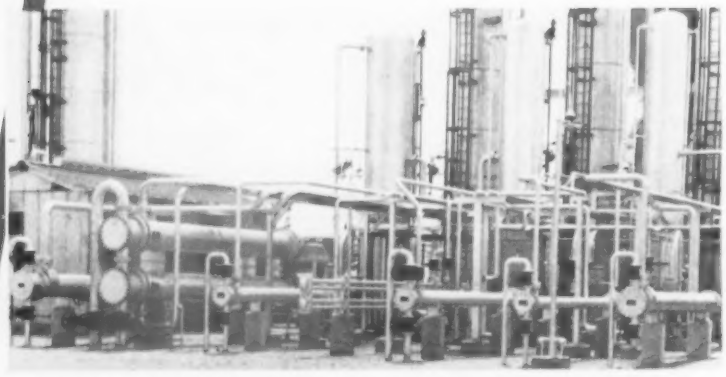


Photo shows COYNCO Type F POWAIRFIN UNITS, with 7 ft. axial flow fans, electrically driven through V belt speed reduction. These units provide the ultimate in ease of erection and maintenance.

The East Vealmore plant, at Big Spring, Howard County, Texas of Reef Fields Gasoline Corporation of Houston, Texas. It was built by Delta Engineering Company of Houston.

COYNCO Heat Exchange Equipment includes STRATUBE Atmospheric and Submerged Sections, COYNCO Shell and Tube Exchangers and COYNCO PowAirFin Equipment. Your request for information will get immediate response.



COYNCO Shell and Tube exchangers in the Reef Fields Gasoline Plant. Exchangers are built in accordance with TEMA standards and API-ASME codes.

COYNCO PRODUCTS are Sold by

Joseph A. Coy, Company, Inc. TULSA, OKLAHOMA

3515 DAWSON ROAD • TULSA, OKLAHOMA
4101 SAN JACINTO • HOUSTON, TEXAS
6399 WILSHIRE BLVD. • LOS ANGELES, CALIF.
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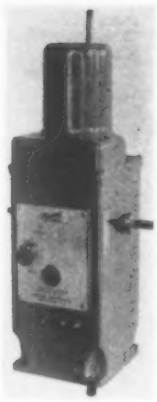
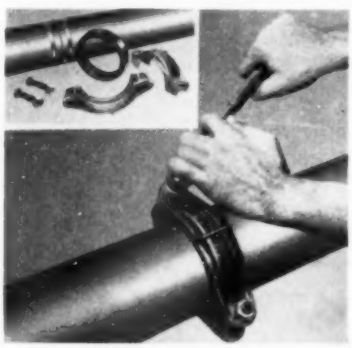


it will slow the engine down. The governor has a unusual combined stability of pneumatic and hydraulic systems for this variable speed operation due to the proportioner system of the governor, keeping a force balance at all times. Hysteresis is eliminated because pilot valve lap is not necessary for stability and pneumatic pressure change is balanced without going through linkage to cause friction. A convenient feature of the governor is that it still has hand dial control of speed and a simple adjustment of range so that the same governor can be used for different pressure conditions on the same line or in the same plant. *The Massey Machine Co.*

IT'S NEW CHECK IT

20 GRUVAJOINT is a new lightweight coupling for grooved pipe systems. Gruvajoints are specifically designed to save time, weight, freight, and space in coupling grooved pipe systems where pressures do not exceed 500 psi. Because Gruvajoints are light and compact, they are easier to handle and store, can be quickly installed in close working areas, and make substantial freight savings possible. The new couplings automatically absorb expansion and contraction, shock, ground motion and vibration. They remain leakproof under end pulls up to 7,500 lb.; permit layout misalignment up to 3°; withstand temperatures between 200° F. and minus 65° F. Gruvajoints can be applied or removed in approximately 1 minute. They can be used again and again. Gruvajoints are suitable for permanent or temporary lines carrying air, vacuum, gases, water, oil, chemicals, or pulverized minerals. *Gustin-Bacon Manufacturing Co.*

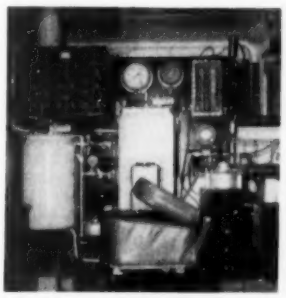


IT'S NEW CHECK IT

21 INSTANTLY SOLUBLE GUMS. A special process enables all water soluble and water dispersable gums to develop full viscosity on introduction to cold aqueous media without any special heating, aging or agitation, making these gums ideally suitable as drilling mud, drilling mud conditioners, lubricant, or for viscosity or emulsion control. Clumping and unreacted dry cores of gum are completely eliminated by this new process. Uniformity from batch to batch is easily maintained. Aqualized gums are available in powdered form. Standard aqualized gums offered are: Tragacanth, Karaya, Locust Bean, Arabic, and CMC. *Soluble Products Co.*

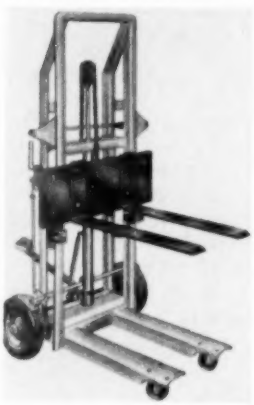
IT'S NEW CHECK IT

22 PORTABLE GAS TESTING UNIT. This unit was designed and fabricated for determining gas-oil ratios, commonly called GPM Tests, for gas condensate wells. Both the separator (2,500 lb. W.P.) and its calibrated gage glass (3,000 lb. W.P.) are mounted in a water bath for positive temperature control. Both the preheater and separator water baths have automatic as well as manual temperature control for greater flexibility. Heating medium is 5-lb. steam. Cooling medium is ice water. The power source bank of Edison batteries furnishes power for the entire unit. This test unit is used to determine the following items of gas condensate wells: Separator condensate recovery, recovery factor when separator condensate is flashed to atmosphere, stock tank condensate recovery, charcoal GPM of vent gas, vent gas specific gravity, condensate gravity, and water content. *Findley Engineering Service Co.*



IT'S NEW CHECK IT

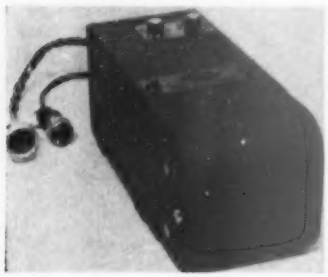
23 NEW HAND MODEL PORTABLE LIFT TRUCK. This new, powerful, one-man hydraulic lift truck will lift loads of 1,000 lb. to a height of 53 in. easily and safely. It will operate in narrow aisles and will turn easily in close quarters. Combination "snap-on" plate permits use as platform truck when forks are not required. Foot lever operation, safety-release pedal and wheel lock, permit one-man operation with maximum safety. These modern units are recommended for materials handling, loading or unloading vehicles, stacking drums and other bulky objects. *Safeway Industrial Equipment Corp.*



IT'S NEW CHECK IT

24 NEW OSCILLOGRAPH MODEL 557 possesses all the operational features of Model 555, while possessing most of the ruggedness and shock resistance of Model 560. The Model 557 has been designed to accommodate the same record magazine as is used on the Model 560. Other important features are: 14 channels of separate data, rigid cast aluminum alloy construction, full-width timing

lines at 0.01 and 0.1 seconds produced by a shutter-type "G"-proof precision timer, and trace identification (beam-interrupter type). The record speed may be varied over a wide range by using its gear-shift arrangement. A full width viewing screen displays traces having a one-to-one deflection ratio with the recording traces. This oscillograph will accommodate any of the wide variety of natural frequencies and sensitivities available in the Models 102, 106, and 108 series of Midwestern galvanometers. *Midwestern Geophysical Laboratory.*



IT'S NEW ✓ CHECK IT

25 INSPECTO-SCOPE is a five-power precision optical instrument designed for surface examination and inspection of hidden or recessed surfaces, wiring, joints, welds, contact points, interior tubular and cylindrical surfaces or similar concealed or partially concealed areas where direct, close visual inspection would be difficult or

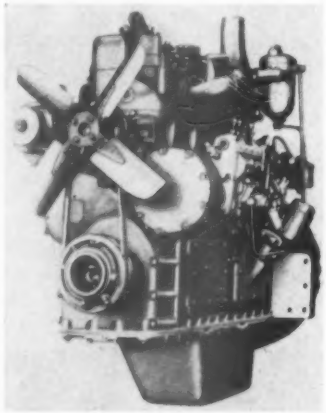
inadequate. The Inspecto-Scope consists of two main parts: the eye-piece, housing the optical system set at 45° from En-tube; and the En-tube, equipped with midget bulb, bulb protector, mirror, mirror cover, light switch, battery cable and poles. The object or surface to be inspected is illuminated by the lighted bulb at the tip of the En-tube. The image is picked up by the mirror and reflected back to the eyepiece where it is magnified five times. The lighted area is at a 45° angle to the long axis of the En-tube. The En-tube revolves 360° which allows the viewer to inspect all inside surfaces or sides of an object without changing the position of the eyepiece. *Badger Sales Co.*

IT'S NEW ✓ CHECK IT

26 FLAW FINDER. The visible penetrant dye inspection process readily finds defects in all metal, glass, and most plastic surfaces. Met-L-Chek dye is water washable, readily removed from the work without special solvents. One drop on any smooth metal surface spreads fast. Almost every phase of the oil business finds use for Met-L-Chek, in maintenance, checking valves, pipe-line welds, tank linings, and drilling tools. The remarkable coverage of Met-L-Chek (about 3,000 sq. ft. per gallon) makes material costs per part inspected negligible. *The Met-L-Chek Co.*

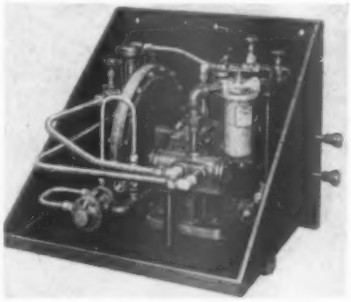
IT'S NEW ✓ CHECK IT

27 BOLINDER-MUNKTELL 4-CYLINDER INDUSTRIAL ENGINE. The 105 series is built in four sizes, 1, 2, 3, and 4 cylinders with each cylinder rated at 11 b.hp. at 1,500 r.p.m. based on British 12-hour continuous duty. Built according to SAE standards, this recently developed series incorporates all the past diesel engine experience of one of the oldest manufacturers in the world, having been established in 1844. These engines are guaranteed for 180 days and fuel consumption is guaranteed not to exceed 0.41 lb. per b.hp. hour at full load. Design of these units is for long life and large reserve power encountered in the heaviest industrial applications. *Bolinder-Munktell.*



IT'S NEW ✓ CHECK IT

28 A NONRETURN VALVE OPERATOR is designed to make a hydraulically operated nonreturn or check valve of a simple butterfly valve. The regulator operates the nonreturn valve to maintain a constant low differential pressure across the valve. A reversal of pressure causes the valve to close, positively and rapidly. The operator has a high power output and will control large tight-closing valves. Because of low permanent pressure loss through the valve, there is a better utilization of compressor power. Counterweights, springs and dashpots are not necessary, the manufacturer states. The operator permits use of a simple internal design valve, free from pockets that can accumulate dirt and tar. *Askania Regulator Co.*



IT'S NEW ✓ CHECK IT

29 SLIP DOG TAGS for easy identification of the proper slip dog for each pipe size are now included with every set of slip dogs manufactured by this firm. The aluminum metal tag is slipped under the rocker pin when the new set of dogs is installed. All assembled slips shipped from the plant will be equipped with the proper size dog tag for easy pipe size identification. *Mission Manufacturing Co.*

How a military aircraft problem led to

The Greatest Gasoline Development in 31 Years

TCP* is a revolutionary new gasoline additive that stops the greatest cause of power loss in modern automobile engines. TCP additive is now blended into Shell Premium, and is available at Shell stations throughout the United States.

With the advent of high octane number fuels for peak performance of both military and civil aircraft, the problem of spark plug fouling became critical. Maximum design performance and range of the aircraft were severely limited by deposits formed on the insulating portions of the spark plugs. These deposits caused malfunctioning of the spark plug often at critical times when maximum spark plug performance was necessary. The problem was studied jointly by petroleum suppliers, engine and spark plug manufacturers, and airframe builders both from the chemical and mechanical standpoint.

Shell Research Mobilized

To tackle the problem Shell mobilized its research facilities. First step was development of a dependable test for spark plug fouling. With this test, Shell had the necessary equipment with which hundreds of compounds could be quickly tested—rejected and tested again in different formulations. Round-the-clock testing finally led to the discovery of Shell's TCP additive.

Not since the introduction of tetraethyl lead in 1922 has there been such an important development in gasoline.

How TCP additive helps existing engines—can lead to even better designs

This remarkable ingredient actually changes the nature of combustion deposits inside an engine; actually makes them harmless. Plug-shorting and pre-ignition are eliminated. Now car owners get up to 15% more power—often before using the second tankful. Spark plug life is increased as much as 150%, and gasoline mileage is improved.

Car manufacturers and dealers benefit too! New cars perform the way designers intended; new car buyers have few performance complaints. And for the future, designers can plan for higher compression and horsepower, lighter and more compact engine designs.

TCP is Shell's trademark for this additive. It is another example of the progressive research that goes forward day and night in Shell laboratories. It is evidence again that Shell research provides more and better products from petroleum.

*Patent applied for

SHELL OIL COMPANY

SHELL

Prolong thread life

When threads are protected they are bound to last longer. 'Bestolife Lead Seal Pipe Joint Compound protects against corrosion, prevents galling and seizing, gives a perfect seal for maximum joint make-up with easy separation.

The Standard of the Oil Country for over 20 years. Unconditionally guaranteed. Sold and exported by supply houses throughout the world. Packed in 1¼, 5, 20 and 50 lb. containers.

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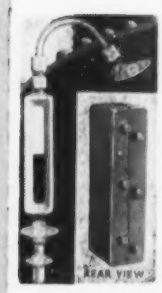


NO GAUGE TROUBLES WITH INFERNO

INFERNO "Clamp Type" Reflex Gauges will put an end to your gauge troubles. They have wider, heavier, thicker glass than the ordinary reflex gauge, reducing glass breakage to a minimum. Thicker glass is a distinct advantage when water conditions are bad. Write for Bulletin 29.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

Among the Drilling Contractors

Active Rigs Increase to New High Mark for Year

Another increase in the number of active rotary rigs was reported during the week ending October 12, boosting the total to 2,880, a new "high" for the year. The total exceeded by 213 the number of rigs reported for the corresponding week a year ago. However, it lacked 152 of equalling 1952's record of 3,032 rigs reported running late in December.

ACTIVE ROTARY RIGS*

Area—	Week ended 10-12-53	Change week ended 10-5-53	Change week ended 10-13-52
Gulf Coast	575	+ 9	+ 21
N. & W. Tex.-N.M.	815	— 1	+ 63
Ark.-N. La.-E. Tex.	190	+ 8	+ 46
Oklahoma	353	— 4	+ 39
Kansas.-S. Neb.	163	— 2	+ 12
Illinois-Eastern	153	0	— 2
Rocky Mountains	288	+12	+ 39
Pacific Coast	166	+ 2	— 1
Total U. S.	2,703	+24	+217
Western Canada	177	+ 1	— 4
Total	2,880	+25	+213

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, North and West Texas-New Mexico, and Oklahoma-Kansas are shown on pages 213 and 214.

Drilling activity in the Rocky Mountain region set a new all-time record for that area with 288 rigs reported running during the week. This total represented an increase of 12 rigs during the week. Small increases also were reflected in the Gulf Coast, Arkansas-North Louisiana-East Texas, Pacific Coast, and western Canada areas. Decreases in other areas were minor.

R. P. Phillips, Lafayette, La., is drilling a 5,000-ft. test at Pine Prairie, in Evangeline Parish, Coastal Louisiana. It is a contract job for Sam J. Recile, of New Orleans. Location is at 1 Bullock, in 36-3s-1w.

Oil Corp. has a rig working for F. B. Cochran and associates, of Corpus Christi, at a wildcat location 5 miles southwest of Skidmore, in the Hugh O'Brien Survey 447, Bee County, South Texas. The operation is 1 Schramm-Mosheim. Contract is for 5,300 ft.

String & Richard tools are drilling Rand Morgan's new wildcat test, 1-B Nueces County, located in the AB&M Survey 415, a mile west of Saxet field, west of Corpus Christi, in Nueces County, lower Gulf Coast of Texas.

Ben McGraw has a contract with Carter Oil Co. for an 8,000-ft. test, 1 Turner, to be drilled in western Logan County of West Central Arkansas. Location, in 15-6n-28w, is 3 miles northwest of Booneville.

Newman Brothers Drilling Co., San Antonio, is the contractor and joint operator with Alaska Steamship Co. and H. L. Rymal on a 7,500-ft. wild-

W. P. (Buster) Bishop (right end), tool pusher, and his day-tour crew on the heavy rig Frank Frawley Drilling Co., Tulsa, is operating for Sunray Oil Corp. in Northwest Branch field, Acadia Parish, Louisiana Gulf Coast. Crewmen, left to right, are: H. W. Gipson, Gerald Marceaux, J. C. Whitehead, E. J. Marceaux, W. Hargrave, and Charlie Warren (driller).

GLOBE
JUNK CATCHER

The Globe Interchangeable Magnet catcher is made in most popular sizes for use whenever desired . . . order by outfit size

still the **first name** in junk recovery tools

When the Globe Junk Catcher is run in on an emergency job, operators never question whether or not it will make a complete recovery . . . IT NEVER FAILS! They know and count on Globe's dependable performance and how it frequently makes complete recovery in one run.

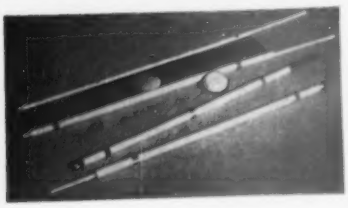
When emergencies occur, contact your local Globe Office . . . complete stocks are immediately available in all principal fields.

GLOBE
OIL TOOLS COMPANY
GLOBE OILTOOLS

Main Office and Plant:
LOS NIETOS, CALIFORNIA

Branches in all principal areas. Refer to your local Classified Telephone Directory for your nearest Globe Branch.

NEW! KRAFTBILT
ALL-PLASTIC, SNAP-ON
MAP STICKS



No more wood, hammers, tacks! Kraftbilt all-plastic Map Sticks are **stronger, easier** to handle. You snap the map to the stick with plastic clips, roll, secure with larger clips . . . map is ready to be filed! One man can do the job easily!

AND KRAFTBILT **MAP WEIGHTS**
Shot-filled horsehide bags—just toss 'em on! They hug your map to the board like an extra pair of hands! Say goodbye to maps with thumb tack perforations and gummy edges left by masking tape. These weights will hold your maps better! Send for Bulletin 352-A.

ROSS-MARTIN COMPANY, Box 800-T
423 E. 4th, **Tulsa, Okla.,** Phone 3-6116

Be sure the connections ARE LEAK PROOF!

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cat test being drilled in the J. M. Brownson Survey, 1½ miles west of Placedo Junction, in Victoria County, South Texas.

Rock Hill Oil Co. has contracted a rig to Billy Bridewell for a projected 7,300-ft. test at 1 W. L. Lewis estate, located 1¾ miles northwest of the South Taft field, in San Patricio County, South Texas. Location is in the Coleman - Fulton Subdivision of the George H. Paul Survey.

Pannell Well Service Co. has a rig under contract to P. R. Rutherford, of Houston, for a wildcat test, 1 Germer, located 8 miles northwest of Ganada, eastern Jackson County, Texas Gulf Coast. Location, in Survey 5, Block 2, is about a mile west of the East Cordele field. Hole is projected to 5,500 ft.

Kelly Drilling Co. has a new 12,500-ft. well under way for The Texas Co. in the Sweet Bay Lake area of St. Mary Parish, Coastal Louisiana. It is the operator's 2 Miami Corp., in 8-17s-12e. Two wells have been completed in the area.

Loffland Brothers Co. is starting another deep test for Union Oil Co. of California in the Tigre Lagoon area of Vermilion Parish, Louisiana Gulf Coast. Location, in 5-14s-5e, is for 3 Delcambere. Contract is for 10,800 ft.

Circle Drilling Co., Lake Charles, La., is contracting for Vincent & Welch at a new wildcat operation 2 miles south of Wilburton, in Jefferson Davis Parish, Louisiana Gulf Coast. The test is listed as 1 Jennings with location in 11-7s-3w. It is projected to 8,800 ft.

J. & C. Drilling Co., contracting for Arnold O. Morgan, is starting another well in the West Helen Gohlke area of Victoria County, South Texas. Latest operation is 2-C Welder, which follows the completion of 3-B Welder as a gas well in sand at 8,536-46 ft.

Kern-Trimble Drilling Co. has a rig working for Lawton Oil Corp. at a wildcat location 4½ miles west of Fouke, in Miller County, southwestern Arkansas. The test, 1-A Smith, in 23-17s-28w, is projected to 6,000 ft.

Green & Heiser Drilling Co. is starting another exploratory test for Oceanic Oil Co. in the South Midway area of Kern County, California. Latest operation, projected to 5,000 ft., is 1 Westates, in 18-32-23, about 2 miles south of Fellows, and about 2 miles from nearest production.

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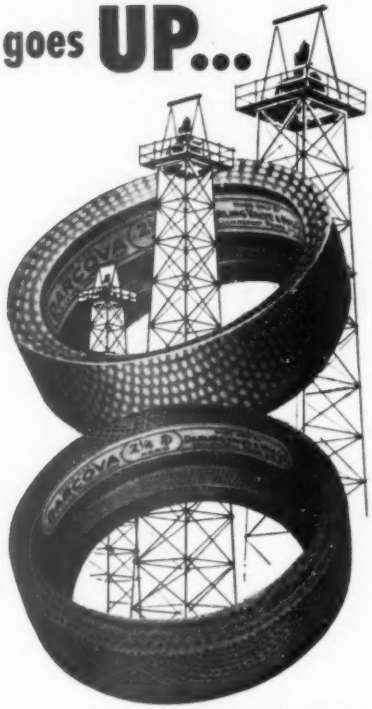

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REFINING

New A.P.I. Committee to Study Evaporation Losses

NEW YORK.—Formation of a new committee charged with conducting an intensive study on losses of petroleum liquids by evaporation was announced here last week by the American Petroleum Institute.

Formerly termed the Committee on Evaporation Loss, this new group has as its specific scope "the development of factors governing the evaporation loss of petroleum liquids for use in the solution of operating problems."

J. H. McClintock of Esso Standard Oil Co., New York, was named chairman. Membership also includes: J. H. Brown, Tide Water Associated Oil Co., New York; W. H. Creel, Phillips Petroleum Co., Bartlesville, Okla.; P. E. Frank, Sinclair Refining Co., New York; H. M. Hart, Standard Oil Co. (Ind.), Whiting, Ind.; R. W. Hill, Stanolind Oil & Gas Co., Tulsa; E. L. Hoffman, Socony - Vacuum Oil Co., Inc., New York; P. F. Irwin, Imperial Oil Co., Ltd., Ontario, Canada; O. W. Johnson, Standard Oil Co. of California, San Francisco; K. G. Krech, Atlantic Refining Co., Philadelphia; H. S. Mount, Sun Oil Co., Philadelphia; H. C. Packard, Shell Oil Co., New York; E. O. Perkins, The Texas Co., New York; G. B. Ryan, Standard Oil Co. (Ohio), Cleveland; A. B. Stevens, General Petroleum Co., Los Angeles; L. S. Wrightsman, Humble Pipe Line Co., Houston; and E. O. Mattocks, A.P.I., New York, secretary.

Meeting recently in St. Louis, the committee formed four operating subcommittees, which are: Method of Testing, H. M. Hart, chairman; Correlations, A. B. Stevens, chairman; Test Program Development, H. C. Packard, chairman; and Program and Publications, W. L. Hoffman, chairman.

Initial reports will be made by the subcommittees in Chicago November 9 at the annual A.P.I. meeting.

Shell Sells $35 Million of Avgas to Eastern Air Lines

TULSA.—Shell Oil Co. has agreed to sell an estimated $35,000,000 worth of aviation gasoline to Eastern Air Lines.

A major part of the fuel will be grades 100 and 115, which will be used to service Eastern's fleet of 105 airships. Deliveries, which will begin February 1, will be made primarily at New York, Washington, D. C., Charlotte, Atlanta, New Orleans, Houston, St. Louis, Louisville, and Indianapolis.

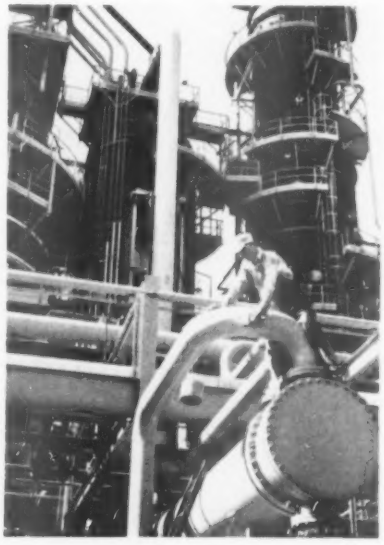
McNutt Gets New Platformer

BRICKLAND, N. M.—McNutt Oil & Refining Co. has placed a 600-bbl. Platformer on stream at its 3,500-bbl. refinery here.

In addition, McNutt is converting a U.O.P. two-coil cracking unit into a three-coil unit increasing the crude capacity from 3,000 to 4,000 bbl. a day. The thermal cracker's capacity will be raised from 1,200 to 1,800 bbl. daily. A new stabilization unit is being added to this latter unit, and the capacity of an existing U.O.P. poly plant is being increased one-third.

Refining Briefs

OIL CITY, Pa.—Pennzoil Co. is replacing three older crude units at its refinery here with a new unit which will have a maximum rated capacity of 12,000 bbl. per day. The new installation will be equipped to strip-finish both distillate and residual products to required specifications. Also



Final Touches for New Unit

Dedication ceremonies last week at Esso Standard Oil Co.'s modernized Everett, Mass., refinery marked the opening of New England's first complete oil refinery. Prior to the ceremonies, a painter gives a new 24,000-bbl. fluid catalytic cracking unit finishing touches.

EL SEGUNDO, CALIFORNIA – This plant for the preparation of feed stock for facilities used in the production of benzene and blending stocks for aviation and quality motor gasoline was designed, engineered and constructed by Fluor for Standard Oil Company of California at their El Segundo refinery. It was completed on schedule and within the budget money appropriated. Fluor has recently been awarded another contract by Standard for the engineering and construction of a 40,000 B/D (Model IV) Fluid Catalytic Cracking Unit – the largest of its kind in the world – including fractionating, gas recovery, caustic treating, hydrogen sulfide removal, additions to the alkylation unit, alterations to the naphtha re-run stills, and offsite engineering – all part of the $20 million expansion program now in progress. Whatever your plans include – a completely integrated plant or the expansion of existing facilities – Fluor's knowledge and experience to design and build for the refining and processing industries, are at your disposal.

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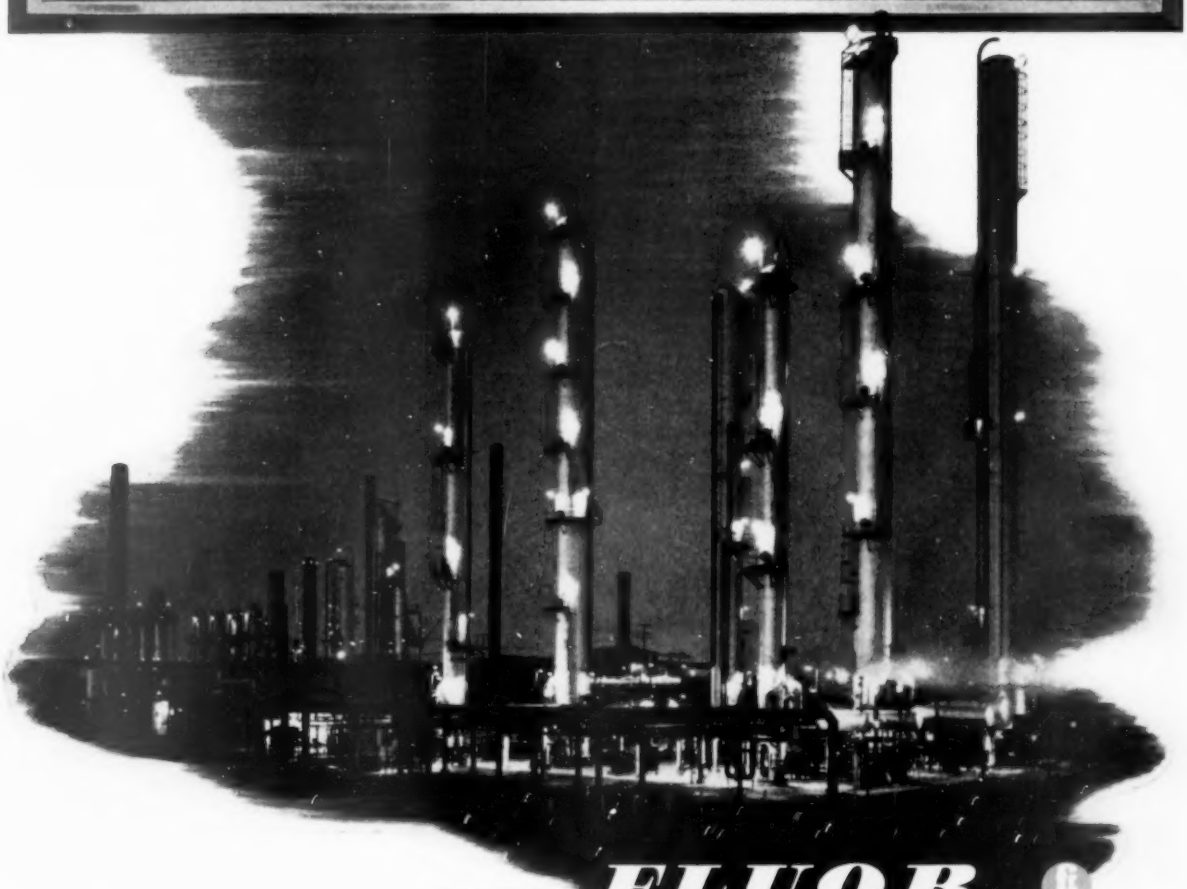

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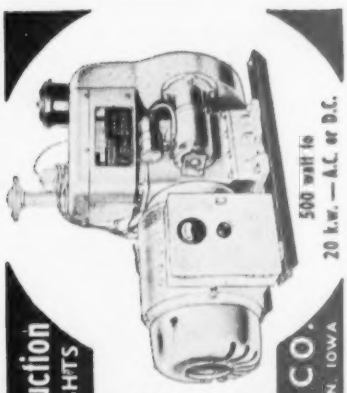
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under construction are two new boilers, each rated at 55,000 lb. per hour.

LAKE CHARLES, La.—Cities Service Refining Corp. reduced crude runs at its refinery here by 7 per cent or about 11,000 bbl. per day last week. High gasoline stocks were given as one of the main reasons for the cutback.

MARTINEZ, Calif.—Shell Oil Co. plans to install a 4,500-bbl. Platformer at its 55,000-bbl. refinery here. The $1,700,000 unit, which will raise the octane count of fuels 25 numbers, is the third to be erected by Shell. The others are located at the company's Wood River, Ill., and Houston refineries.

Petrochemicals

Grace to Expand Petrochem Operations at Memphis

MEMPHIS.—The possibility of expanding the ammonia synthesis plant now being built near here, to the manufacture of other petrochemicals from natural gas, was noted recently by Robert A. Parks of Grace Chemical Co.

Upon its completion in late 1954, the new Grace plant at suburban Woodstock will begin the manufacture of about 150 tons of ammonia per day for direct soil fertilization, plus another 150 tons of synthetic urea for feed supplement and plastic uses.

This first venture of Grace into petrochemicals is said to be only the beginning for the new subsidiary of W. R. Grace Co. It is considered likely that expansion into other chemicals associated with the synthesis of ammonia from natural gas will take place here.

Allied to Purchase Plaskon Division from Libbey-Owens

NEW YORK.—Allied Chemical & Dye Corp. here, will purchase the Plaskon division of Libbey-Owens-Ford Glass Co. at Toledo.

Plaskon manufactures urea formaldehyde plastics for use in such items as plywood glues, electric fixtures, and dishes. It also produces polyester resins which are used in glass-laminated boats and auto bodies.

The selling price was not disclosed, but Plaskon's assets have been placed at over $10,000,000. The deal will expand substantially Allied activities in the plastics field.

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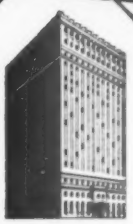
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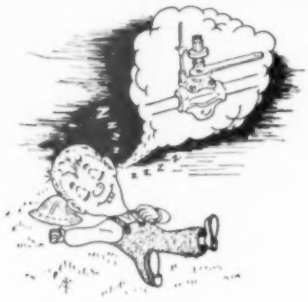

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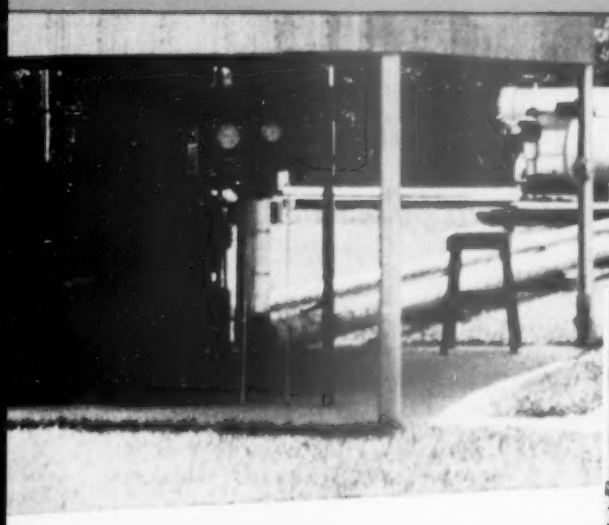

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NATURAL GAS

Fight Continues

Kansas takes price-fixing case to Supreme Court

WASHINGTON.—The Kansas Corporation Commission has asked the Supreme Court to review a federal Circuit Court decision upholding the Federal Power Commission's refusal to accept the state's minimum well-head price on Hugoton field natural gas in determining Northern Natural Gas Co.'s rates.

The FPC last year ruled that the state agency's order issued in 1950 and 1951 putting a minimum price of 8 cents per thousand cubic feet on gas produced in Hugoton field could not be applied to an interstate pipe-line firm. At that time Northern Natural was producing from its own wells in the field and distributing the gas through its own pipe-line system in Minnesota, Iowa, North Dakota, Nebraska, and Kansas. The FPC priced the company's gas at cost of production, which was about 2.5 cents per thousand cubic feet.

New firm formed . . . Immediately the company set up a subsidiary, Northern Natural Gas Producing Co., and turned over all its production in Hugoton to the new firm. Then Northern entered into a contract with its subsidiary to purchase the gas. Since the new producing firm was not engaged in the pipe-line business it could sell the gas at the 8-cent minimum without fear of FPC regulation. The action was in defiance of an FPC order forbidding Northern to dispose of gas committed to the service of the company's lines. However, since the transaction did not impair gas supply to Northern's customers, the FPC dropped the case *(The Oil and Gas Journal, May 4, page 78)*.

Meanwhile, Kansas carried its price-fixing case into the Eighth Circuit Court of Appeals at St. Louis. The plaintiffs contended that the state-fixed price should be attributed as the value of company-produced gas for rate-making purposes. However, the FPC ruling was upheld *(The Oil and Gas Journal, July 27, page 215)*.

Sales Down in August

NEW YORK. — Natural-gas sales continued the normal summer decline in August, according to the American Gas Association here.

During August, sales totaled 3,315 million therms, a drop of 5 million therms from the preceding month. However, this was an increase of 2.9 per cent over sales of 3,223 million therms in August 1952.

Sales for the 12-month period ending August 31 amounted to 52,440 million therms, a gain of 11.6 per cent over sales of 47,009 million therms in the previous annual period. The natural-gas sales index for August was 165.9 per cent of the 1947-49 average.

Trunkline to Supply Central Illinois With Additional Gas

WASHINGTON. — Trunkline Gas Co., Houston, will supply Central Illinois Public Service Co., Springfield, with a maximum of 2,000,000 cu. ft. of gas daily, according to a Federal Power Commission order issued here recently.

The gas will be transported to Central Illinois through a connection to be established near Neoga, Ill. The new supply will go to meet demands in Matton, Paris, Charleston, Ashmore, Kansas, Neoga, Sigel, and Effingham, Ill. However, Central Illinois still needs over 2,500,000 cu. ft. per day to meet all demands of its customers during the 1953-54 heating seasons.

The company anticipates meeting this deficit with gas from its chief supplier, Panhandle Eastern Pipe Line Co., which presently can ship up to 9,178,000 cu. ft. of gas daily into the Matton area, through another proposed pipe-line connection. FPC Examiner Francis L. Hall pointed out that if Trunkline tried to meet the full needs of Central Illinois it might impair the former company's ability to render adequate service to its present customers.

All planned pipe-line construction is expected to be completed and in operation within 3 months.

U. S. Gas Reserves to Last 50 Years, Says Researcher

COLUMBUS. — The United States presently has sufficient natural-gas reserves to last at least 50 years, at which time atomic fuel may be used to fulfill the country's heating needs, according to Dr. Clyde Williams, president of Battelle Memorial Institute here.

Dr. Williams said consumers last year used about 8 trillion cubic feet of gas, but 14.3 trillion cubic feet in reserves were found during 1952. This brought the nation's reserves totals to 200 trillion cubic feet at the end of the year. He pointed out that natural-gas consumption will increase sharply, but that experts believe gas reserves will ultimately nearly triple the present amount.

He added that there should be ample stores of gas with a plentiful supply of coal handy in case natural gas becomes uneconomical. Also, he stated that some day atomic power may be introduced on the heating market revolutionizing the fuel picture.

Colorado Interstate to Up Supply to Kansas-Colorado

WASHINGTON. — Colorado Interstate Gas Co. has been directed by Examiner Edward B. Marsh to supply Kansas-Colorado Utilities, Inc., Lamar, Colo., with about 2,762,408 cu. ft. of gas daily from May through October each year.

The gas will be delivered at an existing connection between the two companies' systems at McClave, Colo. Kansas-Colorado originally asked for 5,000,000 cu. ft. daily during the 6-month period in its application, which was unopposed by Colorado Interstate, filed last March. However, Marsh ruled that the evidence presented at the hearing did not show that the applicant could use all of the gas requested.

July Revenues Rise 27.4 Per Cent Over Last Year

WASHINGTON. — Operating revenues of natural-gas companies totaled $150,705,834 in July, an increase of 27.4 per cent over the same month last year, but down more than $8,500,000 from May, according to the Federal Power Commission.

This is a drop of about $32,000,000 since May 1. However, during the 12-month period ending July 31, revenues were $2,196,758,079 or 21.8 per cent higher than the preceding year.

Sales to ultimate consumers reached 196,762,000,000 cu. ft., a jump of 16.4 per cent over July 1952. A breakdown of these sales to residential, commercial, and industrial consumers showed respective increases of 5.0, 6.9, and 19.8 per cent. Revenues from these consumers rose 23.4 per cent and amounted to $58,918,582.

Net income of the companies for the month was $7,384,197, up 41.3 per cent from July 1952. Net income for the 12 months ending in July was $224,722,931, a 11.9 per cent increase over the same period the previous year.

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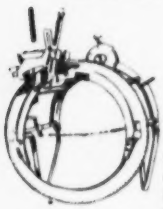

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PIPE LINE

Project Nears End

Southern Natural finishing 440 miles of gas lines

HOUSTON. — Houston Contracting Co., Ltd., here is within 30 miles of completing 440 miles of gas lines through four southeastern states for Southern Natural Gas Co., which is engaged in a $73,000,000 expansion program.

Thus far Houston has completed a 20 and 24-in. supply system from South Louisiana producing areas to Southern Natural's existing transmission system at Gwinville, Miss. From this point across Central Alabama almost to Columbus, Ga., the pipe-line firm has laid 212 miles of 16 and 18-in. loop lines along the transmission line, which terminates at Macon, Ga.

Present construction work is being carried out on a 16 and 18-in. extension of this transmission system to Aiken, S. C. About 10 miles of this line has not been finished between Macon and Augusta. When this is completed, workers will start on a 14 mile, 18-in. line near Wetumpka, Ala. Also, only a few miles of pipe need to be laid on a 120-mile, 14 and 16-in. lateral line running from the new extension at Wrens, Ga., southward to Savannah. This construction is being handled by a sub-contractor, Latex Construction Co. of Georgia.

Price contract . . . Another phase of Southern Natural's vast expansion project was completed in late August by H. C. Price Co., Bartlesville, Okla. This involved laying over 196 miles of 24-in. loops across northern Mississippi, Alabama, and Georgia along another existing transmission line, which extends from western Louisiana to Atlanta. Both Houston and Price started on their respective projects in late 1952. Next year Southern Natural plans to lay about 425 miles of lines, primarily in southeastern and western Louisiana, which will complete the 3-year expansion program *(The Oil and Gas Journal, October 5, page 320)*.

When the program is completed, the company will have about 1,254 miles of new lines and an additional 22,250-hp. in compressor units.

River Construction to Lay Most of Big Products Line

TULSA.—Major portion of the Duncan, Okla., to Memphis products line planned by Oklahoma-Mississippi River Products Line, Inc., will be built by River Construction Corp.

Contract was let to River last week for 97 miles of 10-in. and 303 miles of 12-in. line between Duncan and the White River in Arkansas. Williams Brothers Co. is expected to lay the remainder of the 472-mile line to a terminal on the Mississippi River.

Oklahoma - Mississippi is a newly formed company in which Sunray Oil Corp. holds a 50 per cent interest. Construction is scheduled to begin before the end of the year, with completion set for next July 1. Cost of the project is estimated at $20,000,000. *(For a map and other details, see The Oil and Gas Journal, October 12, page 185).*

Central Kentucky Plans Short 20-In. Gas Line

WASHINGTON.—Central Kentucky Natural Gas Co., Charleston, W. Va., has received temporary authorization of the Federal Power Commission to construct an 8.8-mile, 20-in. gas line paralleling an existing line running north through North Means, Ky., to Cincinnati.

The proposed line, which will cost about $706,300, will provide greater safety and continuity of service to the Cincinnati market area. However, the temporary order limits the company to combined total deliveries of 305,000,000 cu. ft. of gas per day to Cincinnati Gas & Electric Co. and Union Light, Heat & Power Co. of Covington, Ky., until final disposition of the application.

Last May the FPC denied Central Kentucky's application for the new line but a rehearing was opened in September.

Houston Completes 150 Miles Of Gulf Interstate Gas Line

HOUSTON.—Houston Contracting Co., Ltd., has completed over 150 miles of 30-in. line on Gulf Interstate Gas Co.'s 860-mile proposed transmission system running from southern Louisiana to northeastern Kentucky.

Houston is constructing approximately 505 miles of the system from Rayne, La., near Lake Charles to Kinkade, Tenn. Between Rayne and the Ouachita River near Alexandria, La., the company has finished over 30 miles of line. From the Ouachita northeast

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to the Mississippi River at Greenville, Miss., more than 20 miles of line has been laid. Along the spread from Greenville across North Mississippi into Tennessee, nearly 100 miles of line has been constructed.

The remaining 355 miles of line between Kinkade and Gulf Interstate's northern terminus near Ashland, Ky., is being handled by H. C. Price Co., Bartlesville, Okla., which has completed over 100 miles of its project *(The Oil and Gas Journal, October 5, page 320)*. Houston started on its portion of the system in late June and about 6 weeks later Price began its construction work.

Below Lake Charles in the Gulf Coast area, Anderson Brothers Corp., Williams Brothers Co., and Associated Pipe Line Contractors, Inc., are constructing an estimated 230 miles of gathering lines.

Evangeline System Opens

PORT ARTHUR, Tex.—Evangeline Pipe Line System's 191-mile, 16-in. products line from here to Baton Rouge has been completed and is making deliveries.

The line, with an initial capacity of 96,000 bbl. per day, gets most of its products from The Texas Co. and Gulf Oil Corp. refineries here, and Sinclair's Houston refinery through a new 83-mile, 12-in. products line. Some of the deliveries will be dropped off at Opelousa, La., and Baton Rouge, La., but the bulk of the products will enter Plantation Pipe Line Co.'s system for further transportation to Greensboro, N. C.

The Evangeline System is being operated by Texas Pipe Line Co., which owns 40 per cent interest in the line. Gulf Refining Corp. owns 40 per cent, and Sinclair Pipe Line Co. controls the remaining 20 per cent.

P.G.&E. Gas Line Authorized

WASHINGTON.—The Federal Power Commission has authorized Pacific Gas & Electric Co., San Francisco, to construct approximately 11 miles of 24-in. gas lines in the Pittsburg, Calif., area.

About 10½ miles of the line will connect the company Antioch control station with its steam plant now under construction near Pittsburg. The remainder of the new line, which will have an initial capacity of 156,000,000 cu. ft. daily, will connect the control station with the Standard Pacific Gas Line, Inc., system near Stoneman, Calif. *(The Oil and Gas Journal, September 7, page 154)*.

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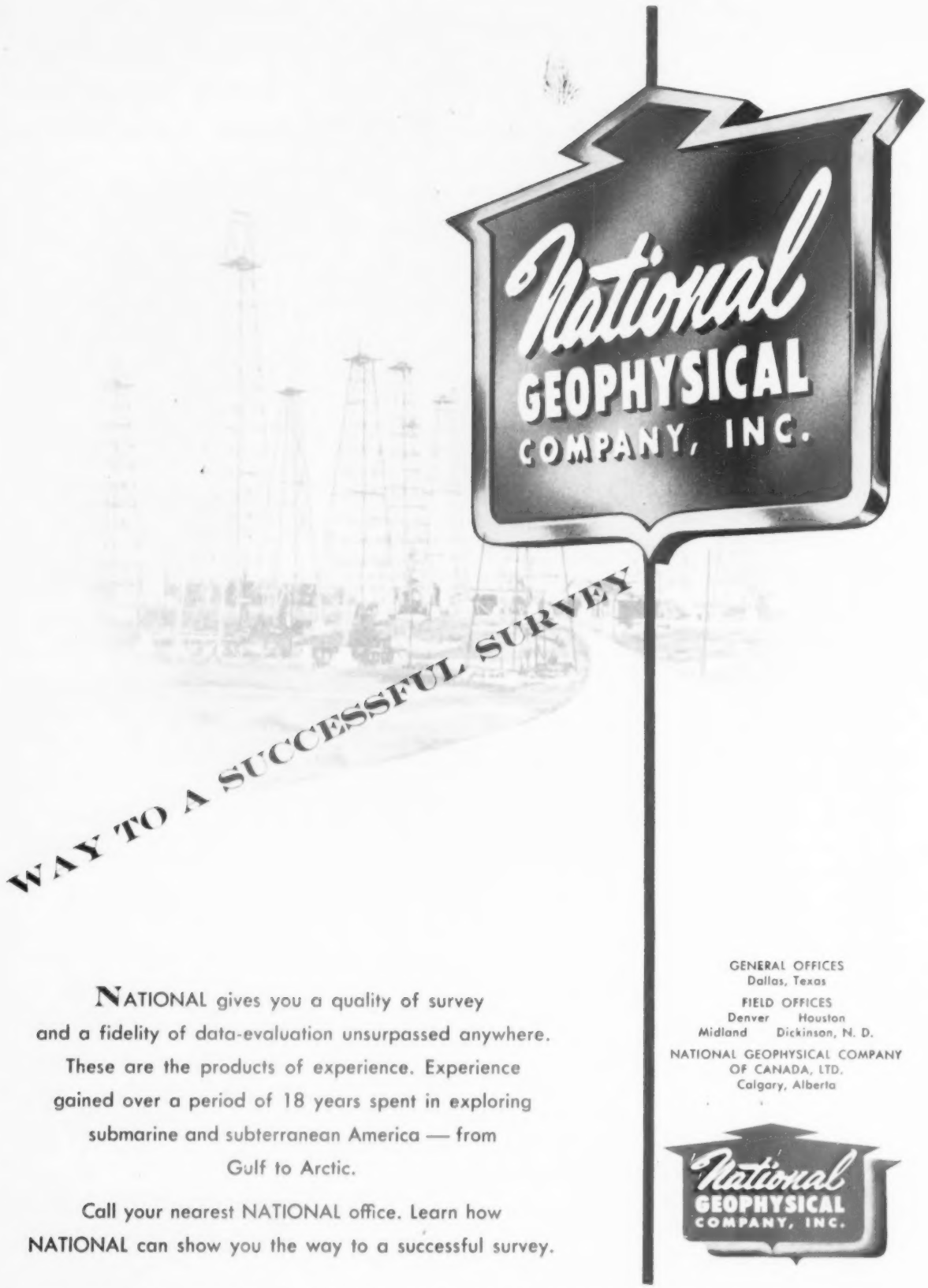

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EXPLORATION

Why Is Western Kansas Neglected?

by Philip C. Ingalls

IT takes a positive indication of the existence of big oil to steam up dynamic interest in an area. Western Kansas' attractive Hugoton embayment has yet to experience this prerequisite for substantial activity, but the day will come.

Western Kansas is an area of carbonate rocks. These carbonates are of all kinds: chemical, evaporative, biochemical, organic, and clastic. They are known to contain all of the kinds of carbonate-rock traps outlined by Frank B. Conselman at the recent meeting of geologists in Wichita: (1) Folded or tilted interstitially porous beds; (2) Fracture and fissure systems; (3) Stratigraphic traps formed by (a) pinchouts and wedgeouts, (b) buried topographic features, (c) lithologic facies changes, and (d) organic facies changes. The entire Mississippian section wedges out to the west, north, and east in the Hugoton embayment (see sketch), making stratigraphic traps especially prevalent in western Kansas.

Western Kansas' carbonate rocks are known to be productive. Hugoton produces gas from Permian dolomites, most of the oil produced on the prolific Central Kansas uplift is from Pennsylvanian and Cambro-Ordovician carbonates, and Pennsylvanian and Mississippian limestones have been found productive of oil and gas in small, widely scattered fields within the sparsely tested Hugoton embayment.

Despite a growing appreciation for carbonates as reservoir rocks, the search for oil in most of the Mid-Continent region is still primarily directed toward finding sands. Western Kansas, being essentially without sands, has not come in for its justifiable share of prospecting.

Somewhere between 50 and 60 per cent of the proved reserves of the world are found in limestone reservoirs. Some of the limestone wells of West Texas' Central Basin platform and Mexico's Golden Lane came in for open-flow potentials estimated in excess of 200,000 bbl. daily. (Such flows are not from caverns but are the result of a well-developed fracture network that gives an almost unlimited gathering system.) Some of the limestone wells of the Middle East and Venezuela's Maracaibo basin are produced efficiently at rates of 20,000 and 8,000 bbl. daily, respectively.

The entire Mississippian section wedges out across the Hugoton embayment.

It is accepted as gospel by many that limestone reservoirs lack the life of sand reservoirs. Production histories do not show this belief to be true. Flash recoveries are known, yes, but most limestone reservoirs are not depleted by a short drill-stem test. Laboratory measurements of recoveries per acre-foot for limestones may be low compared to an average sand and yet limestone reservoirs often perform like sand reservoirs because of fracture systems, the effect of which cannot accurately be worked into laboratory studies.

Reefs are great reservoirs of oil, but oil-bearing carbonate-rock reservoirs are not restricted to reefs. Even in the reef-rich Permian basin most of the carbonate production is from bedded limestones and dolomites. Effective thicknesses of productive dolomites are often measured in hundreds of feet.

At the Wichita meeting, John Emery Adams pointed out that limestones are more efficient in reservoiring oil than clastics—though they make up only a small percentage of the rocks they hold about half of the world's proved reserves. Adams said that this may be due to the fact that limestones fracture easily, giving them extremely high permeabilities over great distances; and do not compact like clastics, which lessens the chance of losing oil once it has been reservoired.

It is strange that the limestones of western Kansas have not received more attention.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

NORTH DAKOTA . . . Amerada Petroleum Corp. recovered highly oil and gas-cut mud and water cushion on a drill-stem test in the Madison at 1 Logan, C SE SW 4-139n-100w, confirmation ½ mile northwest of the recent Fryburg area Madison discovery in Billings County.

COLORADO . . . The California Co. reported swab gages of up to 30 bbl. of oil per hour on first tests of 1 UPRR, NE SW SW 31-8n-66w, Weld County. The well is the confirmation to the Black Hollow area Lyons sand (Permian) discovery. A second offset location is active in the area. Black Hollow is the second pre-Cretaceous pool in the Denver-Julesburg basin.

WEST TEXAS . . . L. M. Glasco, Fryer & Hanson, Roden, Darden & McRae 1 L. L. Butler, wildcat located in 14-A19-PSL, 16 miles northeast of Andrews, flowed at the rate of 4,320 bbl. of oil per day on a drill-stem test at 12,543-63 ft. in the Devonian. Anderson-Prichard Oil Corp. 8 W. F. Cowden, W. F. Cowden Survey 102, Scrap File 9956, 13 miles southwest of Andrews, flowed 139 bbl. of oil in 4 hours in the Ellenburger.

OKLAHOMA . . . Champlin Refining Co. 1 Diamond, NE NE SW 17-29n-17w, Woods County discovery, flowed 25½ bbl. of 43°-gravity oil in 24 hours by heads with 3.7 per cent salt water from Arbuckle on completion.

Selected abstracts of . . .

GEOLOGICAL PAPERS

. . . presented at Mid-Continent Regional Meeting of the A.A.P.G. in Wichita

Paleozoic History of the Central Nebraska Basin

. . . and its relation to anticipated oil and gas exploration.

E. C. REED, Nebraska Geological Survey, Lincoln.

THE western part of the Central Nebraska basin, which appears to be a northward extension of the Salina basin of Kansas, has been the scene of active leasing and seismographic investigations during the past year, particularly in Harlan, Phelps, Kearney, Buffalo, Sherman, Valley, eastern Custer, and eastern Dawson counties. An active drilling campaign in this area is anticipated.

Most of the interest seems to be localized within a broad band along the western side of the basin where the truncated edges of the pre-Pennsylvanian Paleozoic formations are overlapped by the Pennsylvanian and immediately west thereof where there are stratigraphic trap possibilities in connection with lower Pennsylvanian sands that may wedge out against the pre-Cambrian surface as it rises in the Cambridge arch.

The known distribution, stratigraphy, and lithology of the pre-Pennsylvanian formations within this basin is discussed and the probably Paleozoic history of the region reviewed. The Pennsylvanian lithology, distribution, and facial changes are outlined. It is concluded that suitable reservoir rocks occur at reasonable drilling depths in connection with formations of several geologic ages although oil source possibilities and local structural conditions are hard to evaluate. Important unconformities at the base of the Mesozoic, at the base of the Pennsylvanian, and at the base of the Simpson present some interesting possibilities and also suggest that the region should not be condemned on the basis of a comparatively few tests that may not be located to test more than one possibility adequately.

Artificial Fracturing Of Cherokee Sands

. . . in Gibson pool, Cowley County, Kansas.

B. K. CRUMPLEY, The Texas Co., Wichita.

THE Cherokee sands of southeastern Kansas are confined to the Cherokee basin which is limited to the east by the Ozark uplift, to the west by the Nemaha arch, and defined on the north by the Bourbon arch. The basin is also considered to be a northern extension of Oklahoma's McAlester basin. Cherokee sands, while widespread in this area, are not of the blanket type. In Cowley County, Kansas, which lies in the southwestern corner of the Cherokee basin, the sands are quite prevalent, but are concentrated in the western half of the county and on the eastern flank of the Nemaha ridge. An area in which they are particularly abundant centers near Arkansas City which lies approximately 3 miles east of Gibson pool.

Cherokee sediments which are lower Desmoinesian in age, while not the earliest Pennsylvanian rocks in Kansas, are the oldest represented in this area. Early Pennsylvanian seas were confined in southeastern Kansas by the Bourbon arch which isolated this area from the Forest City basin. The Cherokee section is made up predominantly of shales which, for the most part, are clayey or silty and micaceous. Fifteen coal beds and numerous sands have also been identified. The sands are lenticular and noncontinuous, but because of their constant position in the Cherokee section, they lend themselves well to stratigraphic classification. Studies of the shales, coals, and sandstones indicate that they were deposited under cyclical conditions.

There has been some controversy as to the true origin of the sand lenses and also a great deal of confusion as to the correct correlation and nomenclature. The term "Bartlesville" has been somewhat loosely applied to any sand encountered in the lower portion of the Cherokee section. This has been particularly true of the Cowley County area and there is considerable doubt that any sands of Bartlesville age are actually present in this portion of southeastern Kansas.

Development of oil and gas reservoirs of the Cherokee sands in southeastern Kansas may be defined into two major periods. One may be considered that period of development prior to the utilization of hydraulic fracturing treatments, while the other represents that period influenced by artificial fracturing. The first period may also be subdivided into several phases. The first commercial well drilled in Kansas was in 1860 near Paola. The outbreak of the Civil War discouraged any further venture such as this, but drilling was resumed following the war and exploration spread all up and down the Verdigris and Neosho valleys. A major impetus to the development of oil and gas in Kansas was provided by the discovery of El Dorado pool in 1915 and Augusta pool in 1916. A more or less normal period of development followed with a slight decrease in activity being noted up to 1949. In the fall of 1951, the first artificial fracturing treatment was applied to the Cherokee sands in southeastern Kansas with excellent results. This initiated another near boom and for the past 2 years drilling activity has increased many-fold with a great number of new discoveries being the result.

One area in which the hydraulic fracturing of reservoir rocks has produced excellent results is in Gibson pool, 34s-3e, Cowley County, Kansas. The name "Bartlesville" has been utilized to identify the producing horizon in Gibson pool to conform to common usage in this area. However, it is believed the sand should be considered Red Fork or Burbank in age and that no true Bartlesville sand is present in this part of Kansas. The discovery well of Gibson pool, is The Texas Co. 1 Bryant "A," SE SE NW, 32-34s-3e. This well encountered a saturated sand superjacent to the Mississippian, but drill-stem testing of this zone recovered only a minor quantity of mud which was very slightly oil cut. However, after pipe was set and the formation fractured, the 1 Bryant "A" was completed as a flowing well with a potential of 80 bbl. of oil per day on March 3, 1952. There have been 26 new wells drilled within the new pool area. Frequently the reservoir sand was found to be tight with low permeability and porosity conditions indicated by core analyses and drill-stem testing. However, fracturing treatment, both in open hole and through casing, has resulted in obtaining some excellent wells, three of which have been given a maximum production rating.

Nonreef Limestone Reservoirs

JOHN EMERY ADAMS, Standard Oil Co. of Texas, Midland, Tex.

BEDDED limestones and reefs are normally parts of a gradational sedimentary series with the reefs concentrated in the seaward areas. Many major oil fields produce from bedded limestone reservoirs. Bedded limestones are composed of clastic particles which when coarse-grained and cleanly washed resemble clean sharp sands.

If porous, permeable accumulations of clastic carbonates are connected with source beds and sealed with an impervious cap, primary reservoirs result. Lime muds may be excellent source rocks. Dolomitization and secondary solution may improve but do not initiate limestone reservoirs. Fracturing is the main agent for secondary reservoir development.

Oil and Gas Production From Carbonate Reservoirs

FRANK B. CONSELMAN, consulting geologist, Abilene, Tex.

NONREEF carbonate reservoirs include some of the most famous and prolific oil and gas reservoirs in the world, despite the relative emphasis on reefoid masses in recent research and development programs. Approximately 20 to 25 per cent of the world's reserves are believed to be contained in nonreef carbonate rocks.

For general purposes, carbonates are classified broadly as of chemical, evaporative, biochemical, organic, and clastic origin, with examples cited. Although there are classic examples of limestones and dolomites which preserve their lithologic and stratigraphic character for thousands of square miles, probably the majority will exhibit some type of facies differentiation within relatively short distances, both vertically and horizontally. These facies changes provide excellent stratigraphic trap possibilities, even in nonreefed rocks.

Oil and gas reservoirs in carbonates may be caused by the structural deformation of rocks having widespread, relatively uniform, intergranular porosity; by the development of fracture and fissure systems at favorable positions with respect to fluid migration; and by permeability pinchouts in connection with facies changes.

Potentialities of carbonates as oil sources are not fully understood, but oil in minor quantities at least may be generated from certain facies.

Development practices in carbonate reservoirs are influenced by the characteristic irregularity of pore space, the chemical sensitivity of the rock to both natural and artificial leaching, and such physical characteristics as structural strength, rigidity and com-

petency. Although internal differences from conventional sand reservoirs are marked, nevertheless it has been demonstrated that production histories of carbonate reservoirs provide almost identical patterns with sand reservoirs of comparable drive. Primary recovery estimates by volumetric methods necessarily contain large factors of error.

Secondary recovery programs are proving successful in carbonate reservoirs as well as in sands, but the effect of fracturing and channeling must be considered to avoid bypassing large reservoir volumes. Reservoir heating techniques may prove to be applicable.

In future prospecting, applied sedimentology may have as large a field in the carbonate rocks as it has had in the clastics. Practical "trendology" will also be useful, in addition to the conventional fold-finding techniques which have dominated exploration methods in the past.

Occurrence of the Permian Salt in Western Kansas

D. F. MOORE, Stanolind Oil & Gas Co., Oklahoma City.

AS generally known, large Permian salt deposits occur in parts of western Kansas. The distribution and thickness of these deposits are of primary importance to the exploration geologist and seismologist as well as the petroleum engineer.

Specifically, major salt bodies at shallow depths lend themselves well to the storage of L.P.G. petroleum products, providing there exist effective seals above and below the salt. The Wellington, Cimarron-Stone Corral, and Blaine salt sections may all be used for storage purposes; however, their geographic localities differ somewhat. Salt, varying in thickness and purity, is present within each of the latter groups. This paper discusses and outlines the general thickness and distribution of the Permian salt within each group.

Formation of Salt Cavities For LP-Gas Products Storage

G. H. LANCASTER, Stanolind Oil & Gas Co., Elkinwood, Kans.

UNDERGROUND storage of LP-Gas in salt cavities has developed rapidly during the past 2 or 3 years. The majority of this storage is located in producing areas and additional storage is needed in market areas.

Three basic requirements are needed for an effective underground salt cavity storage project: (1) an adequate salt section; (2) fresh water supply to wash out salt; and (3) disposal facilities for produced brine. The attached report briefly presents the availability and evaluation of each of these requirements as applied to Stanolind Oil & Gas Co.'s underground storage project at their Stano plant, Hugoton field, Kansas.

Novinger Pool

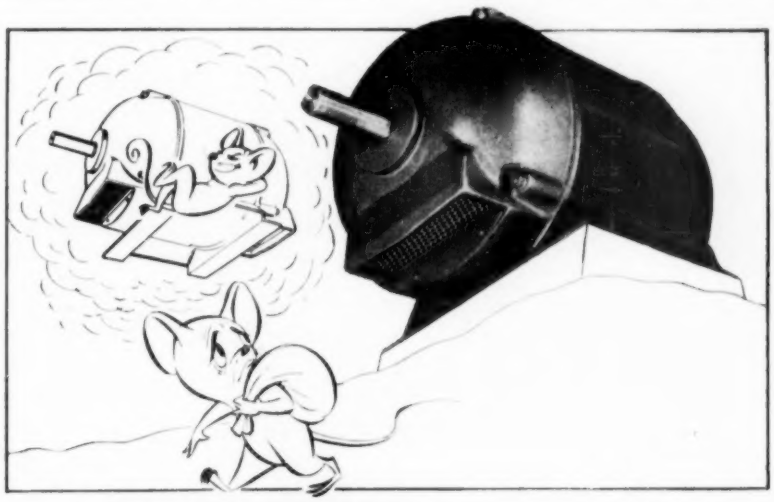
CHARLES A. RENFROE, Columbian Carbon Co., Amarillo.

THE discovery well of Novinger pool was drilled in the latter part of November 1950 on the T. B. Novinger lease, 26-33s-30w, Meade County, Kansas. At the present time 32 wells have been drilled of which 27 produce from the Marmaton, 3 from the Morrow, 1 from the Chester, and 1 gas well from the Atoka. Initial potentials on the wells range from 2,204 to 49 bbl. of oil per day. The average monthly production of the field is 42,000 bbl. of oil. Total accumulative production to August 1, 1953, is approximately 475,000 bbl. of oil.

Most of the oil produced is from a porous limestone of Marmaton age. This reservoir is an elongate reef-like body with a north-south trend. Lithologically, it is a relatively coarse textured oolitic limestone with a large percentage of organic debris. The northern limits of the field have been delimited by three wells that cored dense shaly limestone in the stratigraphic interval represented by the Novinger pay to the south. The southern limits of the field are not known.

The Atoka is a relatively tight shaly sandstone of erratic distribution that apparently marks the Morrow-Atoka unconformity. A small amount of gas has been found in the Atoka. Morrow production is from lenticular sands that occur at various levels throughout the Morrow interval. Although 12 wells have been drilled through the Morrow, only 3 in the north end of the pool have had sufficiently well developed sands to be commercial. These three wells are all oil productive with fairly high gas-oil ratios.

Chester production is from porosity developed in coarsely-crystalline crinoidal limestone at or near the Pennsylvanian-Mississippian boundary. Porosity appears to be secondary and was probably developed by weathering of the Chester limestone during the post-Mississippian-pre-Pennsylvanian erosional interval. Only one well is now producing from the Chester, but another was gaged at 14,000,000 cu. ft. of gas per day with a spray of oil before it was completed higher up the hole as a Marmaton producer. No



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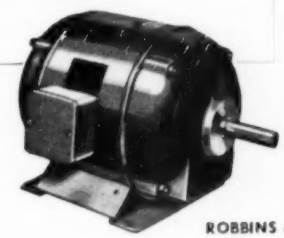

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wells have been drilled through the Mississippian.

Use of Air Photographs In Regions of Low Dip

FRANK A. MELTON, consulting geologist, Norman, Okla.

LINEARS (linear arrangements of drainage lines) many miles in length are common in the plains and low-strata-bench-lands, and are frequently aligned with deep-seated faults, flexures and synclines. They may be useful in locating buried anticlines of regional size that are not otherwise visible. They may assist the geomorphologist and aero-geologist in the proper interpretation of geomorphic features, such as hogbacks, questas, consequent streams, angular or trellis drainage, etc., by means of the stereoscopic study of aerial photos. They themselves, however, are hardly to be classed with such features. They, no doubt, represent the effects of erosion and repeated slight movements along pre-Cambrian faults, and are more regional in scope than ordinary geomorphic features.

Aerial photographs may be studied stereoscopically for a number of reasons which may or may not include associated field work. They have justified their use for many purposes. Their most rewarding use in the flat-lands is for discovery of hitherto unknown structures. Though it is difficult, if not impossible, in the continental United States to find large structures not hitherto known to someone, many structures of smaller size have been discovered by use of aerial photos.

Prismatic and magnifying spectacles are preferred for geological study in the plains regions, tthe prismatic correction varying from 2 to 5 diopters, base out. The smaller prism is useful for strike and dip determinations and makes it possible to recognize dips as low as ¼ of 1°. The larger prism is better for tracing resistant beds. The magnification found most useful by the writer is one-half of one diameter.

In plains regions the problem of securing aerial photographs that are good enough for use by geologists is one that requires special knowledge and experience. The 7-in. by 9-in. vertical photos with which most of the United States was photographed 10 to 15 years ago by the U. S. Department of Agriculture are better for geological purposes than the 9-in. by 9-in. photos now being made. The lens focal-length of 8¼ in. is barely long enough; a 10 or 12-in. focal-length would be much better for dip determinations. Photos made with a 4-in. focal-length are practically worthless. The flight photo-scale of 3.1 in. per mile, being used by the Department of Agriculture, is much to be preferred to scales of less than 2 in. per mile, which are usually employed by the U. S. Geological Survey and some private aerial photographers. The Geological Survey, being, no doubt, aware of the needs of geologists, will presumably one day take the lead in the choice of suitable flight-scale, focal-length, and size of aerial photographs. Aerial photographers who try to sell geologists vertical photos where a square mile is approximately the size of a 3-cent postage stamp are, in effect, presuming that drainage is much more significant than it really is in the discovery of geological structure anomalies. Photo-enlargements made from these small-scale negatives are seldom very useful either, because of the lack of sufficiently sharp definition in the outcropping beds.

Most of the Department of Agriculture aerial photography (the writer estimates 95 per cent) is of very good photographic quality and entirely satisfactory for geological use in the plains. A small percentage of the photography, however, was made with outdated or condemned film, in what was, presumably, a violation of the terms of the contract by the contractor. These photographs, I believe, were made for the most part in Oklahoma and Kansas. Geologists would do well to determine if photographs were honestly made before purchase.

Thickness Maps as Criteria For Structural Movements

WALLACE LEE, Kansas Geological Survey, Lawrence.

A MAP recording the thickness of a sequence of rocks between surfaces that were once flat or relatively flat, records the structural movements that occurred between the development of the limiting surfaces. Such an isopachous map is essentially a structure map of the first surface at the time of the second.

The accuracy with which such maps reveal the structural movements that took place during the interval depends on how closely the limiting surfaces approached a plane. They are most accurate where the confining surfaces were depositional. Beveled erosional surfaces are useful where the topographic relief was low with respect to the regional deformation but, in some cases, may reveal the structural movements only over broad areas.

The relation of the sequence to underlying and overlying formations is important in evaluating the structural significance of the isopachs. Isopachous maps that include formations whose thickness was affected by conflicting patterns of folding express a composite of both movements and reveal neither.

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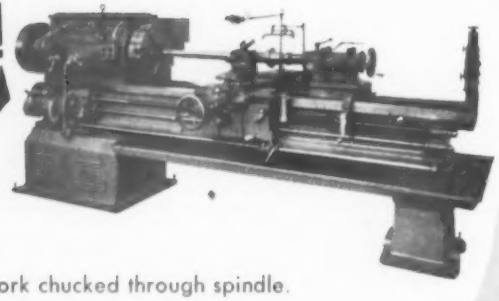

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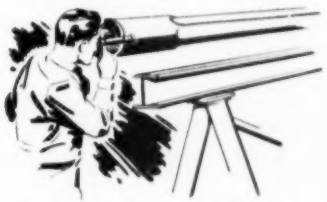

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OKLAHOMA

Arbuckle Flow Reported At Woods Discovery Well

Champlin Refining Co. 1 Harry Diamond, formerly 1 George Dyer, NE NE SW 17-29n-17w, Woods County on the northern shelf of the Anadarko basin in northwestern Oklahoma, is testing in the Arbuckle.

A drill-stem test in the Arbuckle at 6,110-6,113 ft. flowed gas in 13 minutes and oil in 5 hours. Flow rate of the oil was 24 bbl. in 7 hours plus some salt water. Gravity of the oil is 43°. Surface flow pressure was 75 psi. Production in the well is from perforations at 6,134-40 and 6,149-52 ft. A drill-stem test at 6,120-63 ft. flowed gas in 20 minutes and recovery was 90 ft. of 42°-gravity oil, 50 ft. of muddy oil, 180 ft. of heavily oil-cut mud, 90 ft. of heavily oil-cut mud with salty taste and 30 ft. of muddy salt water, oil-cut. No production test has been made of Simpson, Viola, and Mississippian shows as yet. The discovery flowed an estimated 60 bbl. of oil per hour from the Simpson on test at 5,882-90 ft.

Cleveland Wilcox Strike Opened for Flowing

Continental Oil Co. 1 Cook, Jr., Cleveland County Wilcox Wilcox strike in the SW SE NE 15-8n-1w, has been opened after a shut-in period to flow 10 bbl. of oil in 1 hour on 16/64-in. choke.

Production is from Wilcox perforations at 7,181-82 ft. Previously the well flowed 96 bbl. of oil in 24 hours on 18/64-in. choke.

Elsewhere in Cleveland County British-American Oil Producing Co. is drilling ahead at an indicated new pay discovery in Northwest Norman pool. The 1 Reinauer Price, C SE NW 17-9n-3w, is an indicated Bartlesville sand discovery after 200 ft. of 40°-gravity oil and 100 ft. of heavily oil and gas-cut mud were recovered on drill-stem test at 8,069-92 ft. Other pays in the field are the Viola lime and Wilcox sands.

New Osage Area Develops

Kewanee Oil Co. is finaling another good oil well in the new producing area south of Osage County's Northeast Little Chief pool. The 3 Osage, NE NW NW 19-25n-7e, gaged 376 bbl. of oil in 12 hours on ½-in. choke. Burbank sand pay is at 2,820-45 ft. The area was opened at 1 Osage, NW NW NW 19, after fracturing caused the well to flow 284 bbl. of oil in 11½ hours and 150 bbl. in 3 hours thorugh open tubing. The 2 Osage, south offset to this discovery, flowed 405 bbl. of oil in 11½ hours.

This new producing area appears to be a link with Northeast Little Chief pool to the north. Three-fourths of a mile south of the southern-most well in Northeast Little Chief field, Gross Drilling Co. has completed a well in the SE SE SE 13-25n-6e, and is drilling a north offset to this well in the NE SE SE 13.

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CALIFORNIA

Standard Adds New Oil Pool at Rosedale

A southeast edge test to Rosedale field, central San Joaquin Valley, resulted in a new Chanac sand (Pliocene) pool discovery. The Chanac was topped at 4,364 ft., about 230 ft. below the field's regular Lerdo sand pay.

The pool opener was Standard Oil Co. of California 38-1 K.C.L.-31, in SE SW 1-29s-26e. It was completed in the Chanac at 4,685-4,717 ft. for an initial production of 150 bbl. daily. Later its output increased to 338 bbl. daily through an 18/64-in. choke. Gravity of the crude was 20.2°.

New Wheeler Ridge Pool

Richfield Oil Corp. 124-28 Gordon was completed in the Valv zone, Miocene age, to give the Wheeler Ridge Eocene area its fifth producing zone. Bottomed at 3,893 ft., the new pool opener rated a 500 bbl. daily initial production from the interval 3,743-3,893 ft. The flow of 34°-gravity crude was through a ½-in. choke. In addition to this shallower pay, which was found in the northeast portion of the Eocene discovery area, Olcese, Vedder, and Eocene sands are being produced and an Oligocene interval has indicated it will produce gas.

Humbolt Test Shows Promise

A test drilled by West Coast Oil Co. in the Petrolia area of Humbolt County, northern coastal California, showed promise of making a commercial producer. The test, 1 West Coast, yielded an estimated 90 bbl. of 55° to 60°-gravity oil from fractured shale at 1,580-1,620 ft. Production dropped off quickly to about 25 bbl. daily, however. Location of the test is in SE SE 16-1s-2w.

About 3 miles west, in 13-1s-3w, Richfield Oil Corp. was moving in equipment to drill

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1 Zanoni. It will be about 2 miles west of its 1 Walker, recently abandoned at 3,650 ft.

New Tejon Flats Test

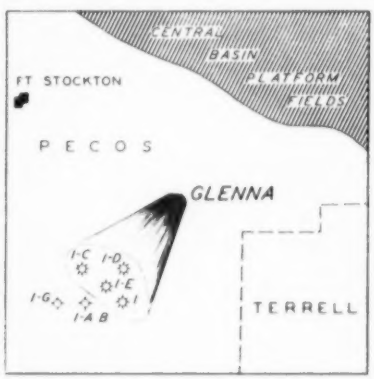
Union Oil Co. was preparing location for a new wildcat in the Tejon Flats area of southeast San Joaquin Valley. The 8,000-ft. test will be in NW SE 36-12n-19w, about 3½ miles north of a 6,900-ft. discovery completed by Union last March. The new field opener produced about 200 bbl. daily for a short period but rapidly declined to only 15 bbl. daily.

TEXAS

WEST TEXAS

Glenna Pool Has Dry Holes, Sharp Formation on Dip

Phillips Petroleum Co. 1-G Puckett, southwest extension attempt in the Glenna pool of Pecos County and first of two dry holes for the area, has added an interesting chapter in the drilling of this deep pool. Drilling reports show the well entered the Wolfcamp group of lower Permian age at 5,254 ft., and the bit was still in that series when drilling stopped at 16,575 ft.



Location of Glenna gas pool in Pecos County in relation to Central Basin platform fields, showing the four producers and two dry holes. Expanded view shows relative positions. No. 1-G Puckett, dry hole on far left, never got out of Permian beds in drilling to 16,525 ft., while 1-A "B" just 1 mile east found the Ellenburger at 14,730 ft.

From that point on the Ellenburger is anybody's guess, but operators of the well were confident the 1-G would run at least 3,000 ft. low on the Ellenburger to others in the field, which would take it down to 18,000 ft. or more.

The 1-G Puckett, in failing to penetrate the Permian, emphasizes the tremendous thickness of these beds in the Delaware basin. From correlations with the nearest well, it demonstrates the extreme sharpness of the Glenna structure, indicating that it is similar to those of the buried mountains beneath the chain of producing fields of the Central Basin platform.

Phillips 1-A "B" Puckett, approximately 1 mile directly east of 1-G, was drilled dry to 16,525 ft. However, this well found the Ellenburger at 14,730 ft., and went into pre-Cambrian granite at 16,502 ft. Operators plugged back and ran many tests up the hole but obtained only short blows of gas. Both

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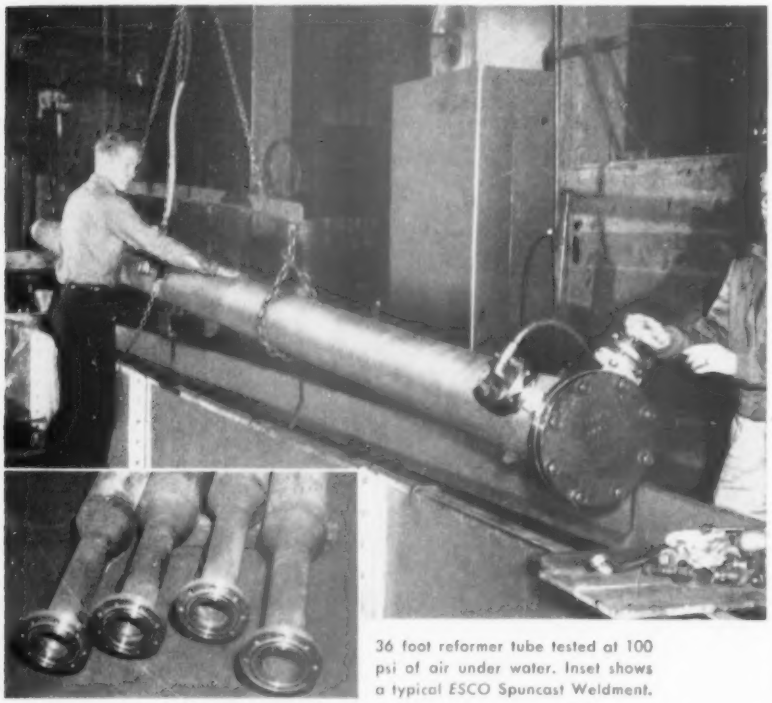

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dry holes are approximately the same elevation.

A resume of Glenna pool development (see accompanying map for locations), shows four completed gas wells, including the discovery. Phillips 1 Glenna found gas pay and completed from perforations between 13,700-14,522 ft., total depth.

Second well was 1-D Puckett, a north extension. This well ran high structurally, having the Ellenburger at 12,670 ft., and pre-Cambrian at 14,210 ft. It found gas in the Devonian and Simpson and completed in the Ellenburger between 13,693-14,100 ft.

Third well for the pool was Phillips 1-E Puckett, also on the northwest trend. This well rated a calculated open flow of 37,500,000 cu. ft. of gas a day from Ellenburger pay between 14,550-15,000 ft.

Phillips 1-C Puckett was fourth well for Glenna pool, located 2 miles northwest of the discovery, and rated by some reports to be the largest well in the pool. Top of the Ellenburger was 13,205 ft. and pay section was between 14,248-14,818 ft. Calculated open-flow potential was 47,000,000 cu. ft. daily.

Phillips currently has five deep operations going in the field.

Ellenburger Discovery Is Completed

Anderson-Prichard Oil Corp. 8 Cowden, 13 miles southwest of Andrews and on the northwest side of San Andres production in Emma field, Andrews County, completed as a flush Ellenburger discovery. Daily potential was 569 bbl. of oil a day through 12/64-in. choke from open-hole pay section between 12,295-12,343 ft., total depth. Top of the Ellenburger was 12,296 ft. on elevation of 3,175 ft. Nearby Ellenburger production is 4 miles west in Embar field, and about the same distance northeast in Triple N field.

In Tom Green County, C. L. McMahon, Inc. 1 Johnson, Ellenburger wildcat 10 miles south of San Angelo, developed an estimated 40 bbl. an hour oil flow from Canyon limestone between 4,506-21 ft. Oil reached the surface on drill-stem test in 1 hour and was allowed to flow for 15 minutes. There was no water reported. Operators were coring ahead.

New Producing Structure For Andrews County

Northeast Andrews County had prospects of another major producing structure at L. M. Glasco et al 1 Butler, 16 miles northeast of Andrews in 14-A19-PSL Survey. Preliminary drill-stem tests on 20 ft. of Devonian pay developed a flow at the rate of 180 bbl. an hour.

Top of the Devonian was 12,543 ft., minus 9,520 ft. The test was run from 12,543-12,563 ft., total depth. Oil surfaced in 27 minutes and was turned into tanks for 20 minutes. Choke size, if any, was not disclosed. Bottom-hole flowing pressure was 4,240 psi. at the start and 5,900 psi. final.

Operators were running casing for further tests and it had not been learned if drilling to the Ellenburger was scheduled. However, observers were of the opinion that Ellenburger production would also be found, as in several of the other new fields of northeast Andrews County. Top on the Devonian was around 200 ft. high to Mabee 1 Newton, dry hole 2 miles northeast.

Owners of the new prospect, in addition to Glasco, are Darden, McRae & Roden, Midland, and a number of individuals ac-

cording to reports. Fryer-Hanson Drilling Co. has contract on the well and a part working interest.

NORTH TEXAS

New Pays and Extensions In Grayson County

Confirmation of a discovery and extension to production was in prospect for the Strawn area west of Whitesboro townsite. A. O. Phillips opened the Strawn pool with completion of 1 T. S. Tidwell, Asa Hartsfield Survey, 1 mile west of Whitesboro. The discovery made a 130-bbl. sand pumper from perforations at 4,462-80 ft. The same operators are drilling an east offset at 2 Tidwell.

A possible confirmation and extension to the above discovery is Howell, Hollaway and Howell 1 G. W. Rue, ¾ mile to the northwest in the same survey. No. 1 Rue developed 420 ft. of oil and 120 ft. of water on drill-stem test in the Strawn from 4,472-86 ft. and operators were running casing for further tests.

These wells are approximately 1 mile south and west of Whitesboro-Oil Creek field, which has production from 4,900 and 5,700-ft. levels.

Nolan County . . . Honolulu Oil Corp. 1 Whitaker, Cambrian sand well in White Flat field, had total depth at 5,683 ft. and operators were drill-stem testing to that depth. Previous tests, making heavy oil flows, were made from 5,511 ft., and on the basis of successive tests, the well had a possible 122-ft. pay section above water.

On test from 5,573-5,603 ft. oil flowed in 7 minutes, gaging 105 bbl. in 1 hour. Recovery in the pipe was oil with no water. Oil again flowed in 7 minutes on test between 5,601-33 ft., gaging 44 bbl. in 30 minutes. On the last reported test, between 5,631-63 ft., open 2 hours, no fluid or gas reached the surface and recovery was 100 ft. of gas-cut mud with a trace of oil, plus 200 ft. of mud and gas-cut salt water. Location is 11 miles east of Sweetwater, and southwest of two Cambrian producers.

TEXAS GULF COAST

Condensate Field Opened On Matagorda Peninsula

Shell Oil Co. has established a new gas-condensate producing area on Matagorda Peninsula, Matagorda County. Its discovery well, 1 Kam, located in the James Duncan League, 7 miles southeast of Matagorda, flowed 6,155,000 cu. ft. of gas with 12.3 bbl. of 43°-gravity condensate per day through 20/64-in. choke on completion gage. Pressure, when shut in, gaged 2,086 psi. Production is from Miocene sand with casing perforated at 6,015-25 ft. Total depth is 7,357 ft.

New Indian Hills Field Extends Southwestward

The new Indian Hills field, in northern Harris County, is virtually assured of its third producer where W. R. Godsey is testing his 1 Mafaffey in the field's Cockfield sand, open through casing perforations at 5,535-39 ft. Although no estimate of productivity has been made as this is written, the well is flowing oil and appears to be as good, if not better, than previous wells.

Location is 1,800 ft. southwest of Federal Royalty Co.'s discovery well, 1 Schweinle, completed last April flowing 121.79 bbl. of 39.2°-gravity oil in 24 hours through 12/64-in. choke from casing perforations at 5,538-41 ft.

Early in September, Godsey extended production of the field 1,200 ft. northeastward from the discovery well at his 1 Meyer, completed in the same pay at 5,540-44 ft. for 40.6 bbl. of oil per day through 12/64-in. choke.

Previously, Federal Royalty Co. had drilled a dry hole 2,415 ft. north of its discovery well at 2 Schweinle.

Wurtsbaugh Field on Texas Coast Revived

The Wurtsbaugh area of Tyler County, Texas Gulf Coast, has been revived with a gas-distillate producer completed the past week by Shell Oil Co. at its 1 Kirby, a wildcat test in C. C. Tyler Survey. The area has been inactive since early in 1950, when the discovery well, completed in 1947, and until now the area's only well, ceased producing.

Shell's new well, located 3,050 ft. north of the discovery well, flowed at the rate of 594 bbl. of 71°-gravity distillate with 3,155,000 cu. ft. of gas daily through chokes, gaging 1,218-psi. pressure on the tubing. Its production is from casing perforations opposite Wilcox sand at 9,131-51 ft. in hole drilled to 9,830 ft. The discovery well, drilled by American Republics Corp. and Houston Oil Co., produced gas-distillate from the pay at 9,070-78 ft.

The area is approximately 5 miles east of Hicksbaugh in the southern part of the county.

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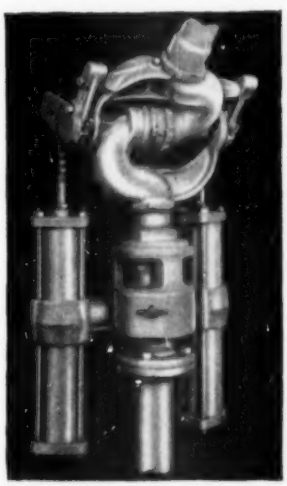

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NORTH DAKOTA

Bowman County Deep Test Planned

Dak-A-Mont Corp. has scheduled a wildcat in SW 13-132n-102w, Bowman County, with Ordovician at about 10,000 ft. the announced objective. Exact location has not been made. The area is about 35 miles east of Little Beaver field in Montana, and is 26 miles southwest of the Deep Rock Oil-Stanolind Oil & Gas deep failure in this county which was drilled in 1952. The well will be drilled by Dak-A-Mont under a working agreement with Truax-Traer Coal Co., according to reports from the area.

Fryburg Confirmation Has Madison Shows

Amerada Petroleum Corp. recovered highly oil and gas-cut water cushion and highly oil and gas-cut mud on drill-stem test of Madison shows at 1 Logan, C SE SW 4-139n-100w confirmation to the Fryburg area discovery. The shows in the second well were not considered as good as those in the discovery itself, but promised a commercial completion according to observers in the area.

Test was of the zone 9,418-51 ft. and recovery was 2,000 ft. of highly oil and gas-cut water cushion, with 1,500 ft. of highly oil and gas-cut mud, with an estimated oil content of 15 per cent. Flowing pressure was 987-1,385 psi.

The pay zone in this well is reported about 12 ft. lower than that of the discovery, ½ mile to the southeast. The operator is reported running logs at total depth of 9,451 ft.

A substantial show in sandstone at shallower depths was tested with commercial possibilities apparent, but no indication of planned completion in the upper horizon has been given by Amerada.

WYOMING

Niobrara County Exploration Planned

Hayes and Harris Drilling and Oil Co. has made location for three wildcats in the northern edge of Niobrara County, and along the southward trend from present heavy Weston County activity. Continued drilling in the Weston County area south and southwest of previous production has made it the most active area in the Rocky Mountain region during 1953, and recent interest in northern Niobrara and northeast converse counties is apparently a corollary of the Weston County campaign.

Sohio Petroleum Co. has completed 1 Unit (Arrowed on map), SE NW SE 36-32n-95w, Fremont County, for a swab gage of 407 bbl. of 22.2°-gravity oil per day from the Tensleep. Gas was found in the Frontier, and oil in the Phosphoria and Tensleep, but no plans for completion other than in the Tensleep have been announced. The confirmation well to this strike is drilling below 4,100 ft.

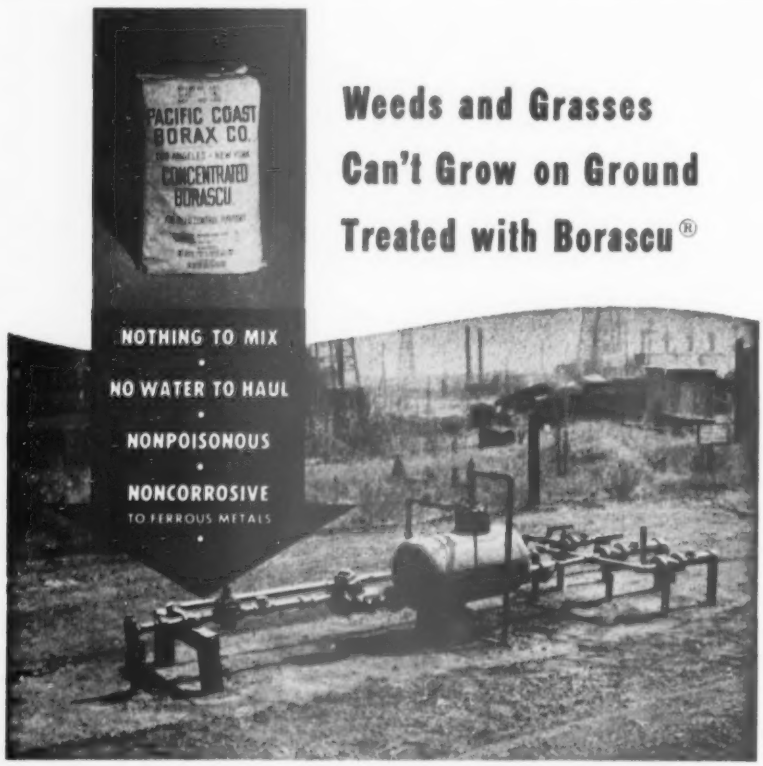
The three new Niobrara County locations are all in Township 40, Range 66w. Locations were made in C NW NW 12; C NW NW 14; and C NW NW 15. The general area is about 12 miles south of production in Weston County.

MONTANA

East Poplar Confirmation Recovers Oil

Empire State Oil Co. has recovered oil in a northwest extension to its recent high potential at 1 Smith, S½ SW SE 8-29n-51e, north of East Poplar field in Roosevelt County. The well is 3 Cornejo, C NE SW 8-29n-51e, the second confirmation attempt since 1 Smith was completed for an announced potential of 6,217 bbl. of oil per day.

Like the discovery well the current drilling



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confirmation made oil from two porosity zones in Mississippian. Test of the A zone from 5,796-5,815 ft. made 1,775 ft. of clean oil and 225 ft. of water in 2 hours. In the B-2 zone interval 5,814-28 ft. the recovery was 4,000 ft. of free oil and 335 ft. of water, also with tool open for 2 hours.

A lower test, reported as in the base of the B-2 zone at 5,827-46 ft. flowed oil and mud at the end of 1 hour and 12 minutes. While reserves circulating the well flowed oil for 20 minutes, oil and mud for 40 minutes and sulfur water, salt water, and mud for 18 minutes. The fluid recovery was estimated 75 per cent oil. The operator will run a second test of the B-2 zone, then drill ahead for test of the C zone. The second well in this area was plugged due to inability to shut off a heavy flow of sulfur water.

COLORADO

Permian Confirmation Swabs at High Rate

The California Co. swabbed 370 bbl. of oil in 12 hours on first reported tests of the confirmation well, 1 UPRR, NE SW SW 31-8n-66w, Weld County. Production is from Lyons (Permian) sand. The discovery well in the area was the second Lyons producer in the Denver-Julesburg basin, but the currently testing 1 UPRR is the first successful confirmation. Total depth of the well is 8,958 ft. with casing landed at 8,890 ft. for completion in open hole. The operator is installing pump.

Sugar Loaf Discovery Near Completion

Mountain Fuel Supply Co. has plugged back for tests of gas zones at 1 Unit, SE SW NE 9-11n-101w, Moffat County. The wildcat made gas at the rate of 6,700,000 cu. ft. per day on test of the interval 5,145-90. The zone is believed to be in Mesaverde. The well was drilled to 7,668 ft. with no data below the 5,200 ft. level released. Plugged back depth is 5,770 ft., and the operator is preparing for tests.

MICHIGAN

The first 100 bbl., or better, Richfield oil well in West Branch pool Richfield oil development program was completed by Ingold Oil Producers at the 2 Zettle, SE SW SW 13-22n-1e, Ogemaw Township, Ogemaw County. This good producer was expected to stimulate additional drilling activity in the field.

The 2 Zettle, an old Dundee oil producer on the west side of the (Dundee) pool, which was deepened to the lower objective, was bottomed out at 4,143 ft. and rated good for at least 100 bbl. of oil daily, flowing, after acid treatment with 6,000 gal. Best oil pays in the Richfield at this week were at 4,041-49 ft., in the upper Richfield, and at 4,128-40 ft., in the lower part of the objective. Well flowed as much as 133 bbl. of net oil in 31 hours on initial test after treatment, 100 bbl. another day, and 150 bbl. in 15 hours on another test. After being shut in for several days, for lack of tank storage, well flowed 175 bbl. About 800 bbl. of oil were sold from the lease in about 9 days.

The wildcat test of the week in Michigan appeared to be Columbia Oil & Gas Co. 1 Custer, SW NE NW 22-17n-8w, Evart Township, Osceola County, which was near Dundee objective and appeared to be from 15 to 20 ft. higher than correlating control

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points. Drill-in was delayed due to problems encountered in running 5-in. casing at 3,879 ft., which is the present depth and well at this point is believed to be less than 7 ft. from the Dundee top. Big question to be answered by the drill-in at this wildcat is whether Dundee section here is dolomite or lime. Wildcat is located about 4 miles due south of Evart Dundee oil pool and approximately 3 miles northwest of Fork Dundee oil pool.

CANADA

D3 Oil Pay Zone Assured Sturgeon Lake Step-Out

Approximately 90 to 100 ft. of oil pay zone has been assured in the D3 Devonian coral reef at Amerada Petroleum Corp.'s 1½-mile northwest step-out venture in the northern sector of Sturgeon Lake, it was learned this week. That well, Amerada's third successful oil completion, rated an initial potenial of 470 bbl. of 37.9°-gravity crude on restricted choke.

The new oil well, the second in the northern sector of Sturgeon, is Amerada F 33-6 Crown "O," LSD 7, 6-72-23w5, 1½ miles northwest of the "O" F 33-32 well which discovered D3 oil about 13½ months ago, and about the same distance north-northwest and west-northwest of a pair of Amerada's follow-up wells that failed to find commercial production. The Sturgeon Lake region is some 185 miles northwest of Edmonton.

The "O" F 33-6 well contacted D3 reef at 8,858 ft., or 6,231 ft. below sea level, 24 ft. higher than the 1952 discovery well to the southeast. Hole was taken down to 8,912 ft., string of 7-in. casing was run to 8,911 ft., and hole was then plugged back to 8,909 ft. Crew perforated from 8,858-8,909 ft., with over 300 shots. During a 4-hour initial potential test, through a 12/64-in. choke, the 33-6 well flowed at rate of 470 bbl. daily. Gas-oil ratio was 1,000 cu. ft. per bbl.

Whitewater Lake . . . The California Standard Co.'s Whitewater Lake area Mississippian oil discovery well in southwest Manitoba has swabbed light gravity crude oil at rate of 5 bbl. hourly, following a sand fracturing treatment.

This discovery, chalked up during mid-September, is Cal Standard 12-16 Whitewater, LSD 12, 16-3-21w1, 44 miles south-southwest of Brandon, 15 miles north of the North Dakota border, and 12 miles northwest of the Lulu Lake area Mississippian oil find.

Whitewater contacted the Mississippian at 2,515 ft., or 851 ft. subsea, and on basis of drill-stem test results encountered some 20 ft. of oil pay above the water. Hole was taken down to 2,539 ft., production casing set, and the Mississippian was treated with sand fracturing. Initial swabbing gave up approximate 34°-gravity oil at rate of 5 bbl. hourly, and pump unit is now being installed.

Forget area . . . Only oil-cut mud was recovered during the initial drill-stem test in the Mission Canyon section of the Mississippian at the Williston-Bobjo 3-19 Moose well in the Forget area of southeast Saskatchewan. This venture, first follow-up to the team's discovery well in that region, on LSD 3, 19-9-6w2, 90 miles east of Regina, found an approximate 15-ft. section of water-free limestone in the Mission Canyon. Further testing of the water-free zone will be necessary to determine if it is possible to complete the well with commercial production.

The oil showing at Williston 1 Bojo 3-19

Moose well came during drill-stem test from 4,017-24 ft. Recovery was 29 ft. of oil-cut mud. Second test, from 4,021-28 ft., gave up 90 ft. of muddy salt water. Crew is now drilling below 4,028 ft.

The 3-19 well is ½ mile west of the 1-19 discovery and 3 miles north of Tide Water's Forget discovery. The Mission Canyon was topped at 4,011 ft., or 1,871 ft. subsea, about 40 ft. lower than the team's discovery.

EASTERN CANADA

Ontario . . . In Sombra Township, Lambton County, Stanwell Oil & Gas, Ltd., of Toronto has signed contract with Ross L. McPherson for the first of a two-to-three deep test well program. The 1 Stanwell on the Martin and Florence O'Leary farm, Lot A, Concession 6 Sombra, has spudded. Location is 2 miles southwest of an area where other interests brought in two gas wells, with rated capacities of 20 and 6 million cu. ft. Two miles southeast of The 1 Stanwell, several gassers with flows varying from 500,000 to 6 million cu. ft., and some producing oil wells ranging from 10 to 150 bbl. a day have been brought in. The deep drilling will test a unitized area of 4,400 acres in Sombra Township, with 50 per cent interest to Stanwell and 25 per cent each to Western Ashley Minerals and Anchor Petroleums.

In addition to the Sombra acreage, Stanwell Oil & Gas has 100 per cent interest in 22,500 acres in other parts of southwestern Ontario. Western Ashley has 100 per cent interest in 10 producing gassers in Wardsville field, and a half interest with Anchor Petroleums in another well; and some time ago completed 7 miles of wholly owned 6-in. pipe line to deliver its production to Dominion Natural Gas Co.

In Brooke Township, Lambton County, Union Gas Co. is drilling on the Russell Johnston farm near Alvinston. Previous tests for gas on the John Hyrniuk and Martin Kuchta properties finished dry in the Guelph-Niagara formation at about 2,200 ft.

LOUISIANA

NORTH LOUISIANA

Three New Pays Recorded In Area in September

Three new pays were opened in northern Louisiana areas during September. Sunray Oil Corp. A-1 Bolinger, 19-22n-11w, South Sarepta field, Bossier Parish, opened gas-condensate production in a stray sand of the Cotton Valley. The well was finaled flowing 300 bbl. of condensate and 2,208 M.c.f. of gas per day through 9/32-in. choke from perforations at 9,162-70 ft. The Davis sand also gave up 56 bbl. of condensate and 1,770 M.c.f. of gas per day through 3/16-in. choke.

A shallow Wilcox oil pay was opened in Wildsville field, Concordia Parish. E. C. Wentworth and Barnett Serior Drilling Co. A-1 Wilds, 18-7n-7e, was completed flowing 83 bbl. of oil per day through 7/64-in. choke from perforations at 4,830½-33½ ft. The other field wells are finaled in the Wilcox sands at about 5,100 ft.

J. A. Harper found Tuscaloosa stringer sand gas pay at 1 Drexlar estate, 1-16n-8e, just south of Delhi field oil production in Franklin Parish. The well flowed 3,800 M.c.f. of gas per day from perforations at 3,274-80 and 3,282-90 ft. through 3/4-in. choke. The new reservoir is a Tuscaloosa sand pinchout, as is the case in the Delhi area.

Pan Am Southern Corp. completed 1 Lay, 6-21n-14w, about ½ mile northwest of Gilliam in Pine Island field, Caddo Parish, extending

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the field ½ mile northeast. It was finaled pumping 28 bbl. of oil per day from shallow perforations in the chalk. Stanolind Oil & Gas Co. 1 Douglas, C NE NE NW 17-21n-14w, extended the same field 1 mile to the north.

APPALACHIAN AREA

WEST VIRGINIA

A location for a deep rank wildcat test in Union district, Preston County, West Virginia, Columbian Carbon Co., 1-1195 Ethel Mullenax et al, elevation 2,635 ft., Kingwood Quadrangle 5.30 miles south of latitude 39 degrees 20 minutes and 2.40 miles west of longitude 79 degrees 30 minutes. Roaring Creek district, Randolph County, Fox & Trimble 1 King & Casad, wildcat, elevation 2,526 ft., was dry, Fifth sand 2,290-2,344 ft., TD 2,545 ft., Blaho Oil & Gas Co., 1 E. & M. Joyce estate, elevation 2,356 ft., recorded the Bayard sand 2,336-2,364 ft., with a show of gas 2,343-2,347 ft., and shut down for shot.

Springfield Township, Fayette County, Southwest Pennsylvania: Acme Die & Machine Co., 1 Buttermore heirs, wildcat resulted in a dry hole. The Tully lime was recorded at 7,772 ft., TD 7,861 ft.

OHIO

E. H. Everett Co. completed a producer in the center of a square mile of undeveloped land in the northeast part of Hanover Township, Licking County. The test, on 4 Frank Westbrook, Lot 10, made a fair showing natural and 92 bbl. oil and 360,000 cu. ft. gas in 24 hours after fracturing.

An unusually large well for the shallow eastern fields was completed by F. C. Wells et al. on U.S.A., Sec. 34, Perry Township, Monroe County. Injun sand was topped at 1,618 ft. and drilling completed at 1,621 ft. with an open flow of 2,000,000 cu. ft. natural.

In Mt. Zion pool in Jackson Township, Knox County, Mid East Oil Co. extended the pool one-third mile on the northwest side with a 240-bbl. well on 3 R. E. Rusk, Sec. 24. Clinton at 2,924-62 ft. made only a small show natural but responded to a fracture treatment.

MISSISSIPPI

Wilcox Oil Indicated in Two Adams County Tests

Two wildcats, less than a mile apart, in northeastern Adams County, are testing promising oil showings encountered in Wilcox sand. Both are in 35-8n-1w, about 3 miles north of Cranfield field.

Both wildcats got oil flows in starting tests, but in each case water broke in, and initial casing perforations have been squeezed. Both are being reperforated for further tests.

One, John S. Callon 1 Foster, was perforated initially at 5,702-12 ft., getting 41°-gravity oil. It had been drilled to 6,520 ft., and has casing run to 5,746 ft. It also had good oil showings in a zone at 4,266-74 ft.

The other, Lindsey-Biglane-Callon 1 Armstrong, 4,800 ft. north of the Foster well, was perforated initially at 4,252-69 ft., getting 29°-gravity oil. It had been drilled to 6,505 ft., and has casing run to 4,326 ft.

KENTUCKY

WESTERN KENTUCKY

Rodger Badgett recovered 660 ft. of clean oil, 60 ft. oil and gas-cut mud, no water, in the Jackson sand on test at 2,273-97 ft. at 1 Ellis-Sheets unit, 9-L-26. This is the first Jackson sand saturation anywhere in this area, promising further activity.

EASTERN KENTUCKY

In Bell County, southeastern Kentucky, Petroleum Exploration Co. was fishing at a total depth of 2,350 ft. at its wildcat 2 Bringardner Lumber Co.

In Owsley County, 6-K-71, R. H. Baker 1 Fred Taylor, a wildcat 6 miles east of Island Creek pool is drilling at 1,186 ft. Well is designed to test the Corniferous lime.

INDIANA

A new Renault sand producing area has recently been opened in Posey County. E. F. Moran and John B. Buchman have 1 well completed in the Renault, which has produced very little oil in the Tri-State area. Another well has casing set after a successful drill-stem test, and another well is drilling across the county line in Gibson County. The 1 Doll heirs, NE NE NW 35-3s-13w, was completed in September for 120 bbl. of oil per day from the Renault sand at 2,703-11 ft. Casing has been set at the east offset, the 1 Lela Almon, NW NW NE. A drill-stem test at 2,707-15 ft. recovered 155 ft. clean oil, 150 ft. mud-cut oil and no water.

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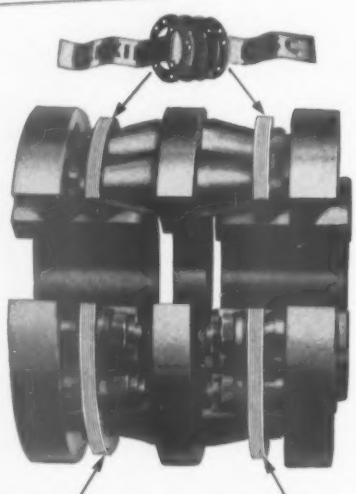

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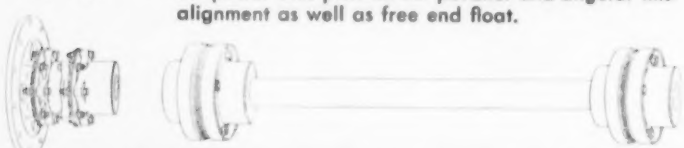

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Duval County: Argo Oil Corp. 1 Butler-State, SK & K Sur. 452. Dry. TD 4,011 ft.

Jake L. Hamon 1 Allen, GB & CNG Sur. 216. Dry. TD 3,075 ft.

Guadalupe County: F. A. Gillespie & Sons Co. 1 Volkman, William C. Wilson Sur. 59. Dry. TD 2,672 ft.

Hidalgo County: Charles A. Daubert 1 Westag Corp., Porcion 42. Dry. TD 4,520 ft.

Sunray Oil Corp. 1 Beaurline, Santa Anita Grant, A-63. IP 71.05 BOPD, 12/64-in., 53.2°, casing perforation 5,650-55 ft. TD 9,201 ft. (New field.)

Union Producing Co. 1 Pope est., Steele & Pershing Subd., Porcion 67. IP 11,500 M.c.f. daily, open flow, casing perforations 6,319½-31½ ft. TD 6,386 ft. (Extends East Hidalgo field.)

Jim Hogg County: Hawn Brothers 1 Guerra, Share M-10, Las Cuevitas Grant, A-135. Dry. TD 3,110 ft.

David L. Gordon 1 East, Block 35, A. V. Prado Sur. 42, A-253. Dry. TD 6,012 ft.

Jim Wells County: Calvert & Manley 1 Adams, Robert Adams Sur. 6, A-3. IP 30,000 M.c.f., open flow, casing perforations 4,294-4,301 ft. TD 5,225 ft. (Extends, and new pay in West Alfred field.)

Regal Oil Co. and James S. King 1 Sengelmann, Lot 12, I. Lang Subd., Casa Blanca Grant, A-296. Dry. TD 5,895 ft.

W. Earle Row 1-F Embleton, Block 7, Welhausen & Driscoll Subd., La Tinaja de Lara Grant. Dry. TD 5,360 ft.

H. R. Smith and George H. Coates 1 Floyd, Lots 52 and 53, Block 20, Magnolia Fig & Orange Colony Subd. Dry. TD 6,471 ft.

Wymore Oil Co. 1 Laughlin Unit 1, R. P. Haldeman Subd., San Francisco Grant. IP 4,650 M.c.f., open flow, casing perforations 3,181-91 ft. TD 3,790 ft. (Extends Haldemann field.)

Medina County: R. S. Hays and Charles A. Daubert 1-A Carter, T. R. Littleton Sur. 152. Dry. TD 1,456 ft.

Nueces County: Renwar Oil Corp. 1 State, Tract 218, Aransas Bay (offshore from Taylor Island). Dry. TD 8,665 ft.

Southern Minerals Corp. 1 Gillum, Section 187, F. Z. Bishop Subd., Palo Alto Grant. Dry. TD 1,551 ft.

Seaboard Oil Co. of Delaware 1 Lehman, Sec. 25, Laureles Farm Tracts (London area). Dry. TD 4,600 ft.

Atlantic Refining Co. 1 State, Tract 63, Corpus Christi Bay. IP 3,530 M.c.f. daily, ¼-in., Greta sand 6,250-58 ft., 6,264-72 ft., and 6,284-94 ft. (casing perforations). TD 8,305 ft. (New field—East Corpus Christi.)

Atlantic Refining Co. 1 State, Tract 62, Corpus Christi Bay. IP 3,180 M.c.f. daily, ¼-in., casing perforations 6,212-18 ft., 6,228-36 ft., 6,246-54 ft., and 6,268-82 ft. TD 6,351 ft. (Extends East Corpus Christi Bay field.)

Starr County: Bass & Vessels 1 Quintanilla Unit, Tract 43, Porcion 84. Dry. TD 1,939 ft.

O. W. Killam 1 Guerra, Porcion 56. Dry. TD 4,012 ft.

Continental Oil Co. 19 Cameron, Sur. 138. Oil well, no gage, casing perforations 4,587-90 ft. (Frio). TD 5,655 ft. (New pay in Cameron field.)

Webb County: Glen G. Mortimer, Jr., 1 Adami, H & GN Sur. 913. Dry. TD 2,014 ft.

Wilson County: A. W. Phillips 1 Lorenz,

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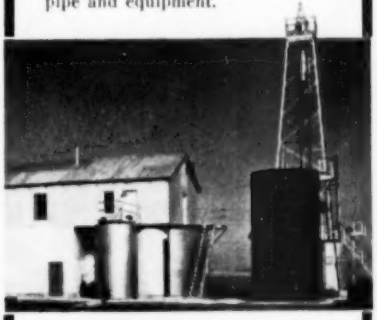

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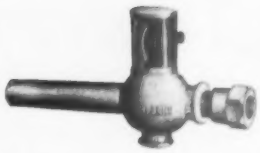

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WILDCAT COMPLETIONS

Morris Mays Sur. 37, A-204. Dry. TD 5,491 ft.

Zapata County: Bridwell Oil Co. 2 Rodriguez, Share "E," Charco Redono Grant 263. Dry. TD 4,106 ft.

J. B. Vassey 1 Lopez, Sur. 288, A-487. IPP 7.7 BOPD, 28°, Cole sand 989-90 ft. (open hole). TD 990 ft.

TEXAS GULF COAST

Bee County: Inca Drilling Co. 1 Harris, Charles Baker Sur., A-112. Dry. TD 7,100 ft.

Pontiac Refining Co. and McKenzie Brothers Drilling Co. 1 Scott, Jose Maria Uranga Lge., A-68. Dry. TD 3,381 ft.

Rhodes Drilling Co. and W. M. Averill, Jr., 1 Miller, Franklin Lewis Sur., A-385. Dry. TD 2,700 ft.

Chambers County: Central Exploration & Development Co. 1 White, James Jackson Sur., Section 16, A-393. Dry. TD 11,072 ft.

Colorado County: Ohio Oil Co. 1 Davies et al, Naham Mixon Sur., A-402. IP 100 M.c.f. daily, open flow, casing perforations 2,211-21 ft. TD 6,012 ft. (New pay in Garwood field.)

Fayette County: Sutton Drilling Co. 1 Arnin, William Kuykendall ⅓ Lge., A-219. Dry. TD 2,257 ft.

Hardin County: General Crude Oil Co. 1 Niendorff, Joseph Carriere, A-6. Dry. TD 10,012 ft.

Jackson County: H. J. Chavanne trust 1-B Borchers, John Footman Sur. 11. Dry. TD 4,515 ft.

Jefferson County: Sparta Oil Co. 1 Lanman, A. Houston Sur., A-3. Dry. TD 6,506 ft.

Liberty County: Austral Oil Exploration Co., Inc., 1-A Worrall et al, David Minchey Sur., A-85. IP 42.58 BOPD, 7/64-in., 40.7°, casing perforations 5,485-93 ft. TD 7,599 ft. (New pay in South Liberty field.)

Phillips Petroleum Co. 1 Champion, Jordan West Sur., A-116. Dry. TD 10,503 ft.

Live Oak County: W. J. and A. P. Buzzini 1 Schwartz, John Turner Sur., A-38. Dry. TD 1,278 ft.

Montgomery County: D. D. Feldman Oil & Gas Co. et al 1 Teas, James Edwards Sur., A-190. Dry. TD 11,631 ft.

Tyler County: Shell Oil Co. 1 Kirby, C. C. Tyler Sur., A-795. IP 594 BCPD and 3,155 M.c.f. daily, adjustable choke, 71°, casing perforations 9,132-51 ft. TD 9,830 ft. (Reopens Wurtsbaugh field.)

Victoria County: Currie B. Davis and Norman C. Hurd 1 Ekstrum, SA&MG Sur. 10. Dry. TD 7,412 ft.

San Jacinto Petroleum Corp. et al 1 Bracken, T&NO Sur. 7, A-360. Dry. TD 4,650 ft.

EAST TEXAS

Anderson County: Humble Oil & Refining Co. 1 Northeast Neches Oil Unit, F. Curbier Sur., 4½ mi. NE Neches. IP 139 BOPD, 3/16-in., 39°, Woodbine perforations 4,704-10 ft. TD 5,493 ft.

Cherokee County: Gas & Oil Exploration Co., Inc., 1 Lee Holcomb, E. Gibbs Sur., A-21. Dry. TD 5,127 ft.

Harrison County: Ed Hurley 1 Flossie Hamilton, Bethany Rogers Sur., A-20. Dry. TD 6,772 ft.

Smith County: J. N. Williams 1 S. L. Driver, Peter Wade Sur. Dry. TD 2,386 ft.

TEXAS PANHANDLE

Nabob Production Co. 1 Beulah Edge, 169-M2-BS&F. 1¼ miles S Quinduno production. Dry. TD 4,116 ft. in dolomite.

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These maps are lithographed in three colors and give locations and names of both oil and gas fields.

Small scale—Journal page size—they are convenient for ready reference in field or office. Survey lines make easy plotting of new wildcat locations.

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WILDCAT COMPLETIONS

WEST CENTRAL TEXAS

Brown County: Saddler Drilling Corp. 1 Burger, Sec. 13, HT&B. Dry. TD 1,480 ft.

Callahan County: Johnson & Warren 1 Shrader, Matilda Cherry Sur. 1. Dry. TD 1,800 ft.

Lion Oil Co. 1 Favor, Sec. 20, BBB&C Sur. Dry. TD 1,353 ft.

Coleman County: C. C. Cole 1 S. E. Weaver, Sec. 271, Andrew Goble Sur. Dry. TD 2,340 ft.

Lewis Franklin 2 Mathews, Blk. 101, C. T. Pendleton Sur. 274. Dry. TD 2,008 ft.

J. J. Lynn 3 McCormick, Caldwell CSL Sur. 249. IP 47 BOPD, 12/64-in., pay 1,105 ft. TD 1,130 ft.

J. J. Lynn 5 McCormick, Caldwell Sur. 249. Dry. TD 1,379 ft.

Haynes B. Ownby Drilling Co. 1 Gallaway, Sec. 41, BBB&C Sur. Dry. TD 3,671 ft.

Ken Woods Co. and Dale Smith 1 Lucile Baker-DD, Blk. 110, Wade H. Bynum Sur. 272. Dry. TD 2,083 ft.

Comanche County: J. K. Wadley 2 Joe McFarlane, Sec. 17, ETRR. Dry. TD 2,266 ft.

Eastland County: Crandall & Anderson 1 T. E. Clark, 45-3-H&TC. Dry. TD 1,230 ft.

M. O. Johnston, Jr. 1 R. W. Fox, Sec. 30, Lge. 2, McLennan CSL. Dry. TD 1,225 ft.

Fisher County: Jones & Stasney 1 Emma Moore, 257-3-H&TC. Dry. TD 6,205 ft.

Haskell County: S. C. Herring Drilling Co. 1 Lott, Sec. 14, Wise CSL. Dry. TD 5,886 ft.

Sid Katz Exploration Co. 1 Knipling, J. G. Pitts Sur., A-338. Dry. TD 5,561 ft., elev. 1,543 ft., Mississippian 5,519 ft.

Kendrick, Lucas & Kendrick 1 Ed Ivy, 3-3-H&TC. Dry. TD 1,888 ft.

Jones County: Sid Katz 1 L. E. McKee, 22-16-T&P. Dry. TD 5,065 ft., elev. 1,685 ft., Ellenburger 4,961 ft.

Nolan County: General Crude Oil Co. 1 J. P. Brown, 286-64-H&TC. Dry. TD 5,357 ft.

Palo Pinto County: Pete Hall Drilling Co. 1 Watson, 38-2-T&P. Dry. TD 1,520 ft.

Shackelford County: Phil S. Kendrick, Jr. 1 Glen Leach, Sec. 15, LAL Sur. Dry. TD 970 ft.

Stonewall County: Jones & Stasney 1 Herron Flowers, 12-A-Arnold & Barrett Sur. Dry. TD 6,525 ft., elev. 1,716 ft., Mississippian 6,245 ft., Ellenburger 6,394 ft.

Taylor County: S. C. Herring 1 Williams, A. S. Wilder Sur. 404. Dry. TD 4,491 ft.

Throckmorton County: Bay Petroleum Corp. 1 Bruton, Sec. 2175, TE&L. IPP 45 BOPD, 39°, pay 4,159 ft. TD 4,164 ft.

G. E. Kadane & Sons 1 Lawson Heirs, Sec. 1636, TE&L Sur. Dry. TD 4,715 ft.

E. R. Perkins 1 Travis CSL, Blk. 40, A-254, Travis CSL. IP 83 BOPD, ½-in., pay 3,888 ft. TD 5,052 ft.

NORTH TEXAS

Archer County: Harry Snebold 1 H. Hawkins, Blk. 22, H&TC Sur., A-1272. Dry. TD 1,690 ft.

Denton County: Minnick-Martin 1 Major L. Moore, H. Tierwester Sur., A-1241. Dry. TD 1,785 ft.

Grayson County: D. D. Feldman Oil & Gas Co. 1 Bailey, James Coryell Sur., A-261. IP 180 BOPD, 13/64-in., 42°, perforated 7,664-66 ft. TD 8,214 ft.

H. L. Hunt 1 Sarah F. McRae, J. L. Atchison Sur., A-21. IPP 250 BOPD, 35°, pay 7,584 ft. TD 7,767 ft.

Knox County: British American Oil Production Co. 1-C Hamilton, 20-13-H&TC. Dry. TD 6,348 ft., elev. 1,530 ft., Ellenburger 6,311 ft.

Montague County: Arnold H. Bruner 1 Corado, J. H. Graham Sur., A-1277. Dry. TD 6,417 ft.

E. B. Clark 1 V. E. Deweber, J. A. Diaz Sur., A-183. Dry. TD 6,957 ft., Simpson 6,644 ft., Ellenburger 6,732 ft.

J. C. Jennings 1 Agee Estate, Blk. 5, John Short Sur., A-663. Dry. TD 4,127 ft.

J. C. Mann, Jr. 1 Susan Melton, A. A. Lewis Sur., A-420. Dry. TD 6,243 ft.

Miami Operating Co. 1 Lunn, Sec. 36, on division line of Blk. 35 & 36, J. Y. Castillo Sur., A-120. Dry. TD 5,963 ft.

Osage Exploration Co. 1 Lula D. Moss, Blk. 96, G. Bayne Sur. Dry. TD 6,308 ft.

Martin Wunderlich 2 McNatt, Blk. 9, James Bourland Sur., A-38. Dry. TD 6,010 ft.

Wichita County: I. Dee Campbell 1 Waggoner, Blk. 6, Hezekiah George Sur., A-454. IPP 25 BOPD, pay 1,470-72 ft. TD 1,520 ft.

Wilbarger County: Hemlhipp et al 1-B Hemphill-Waggoner, Sec. 42, MEP&P, A-495. IPP 32 BOPD, 37°, pay 2,390 ft. TD 2,424 ft.

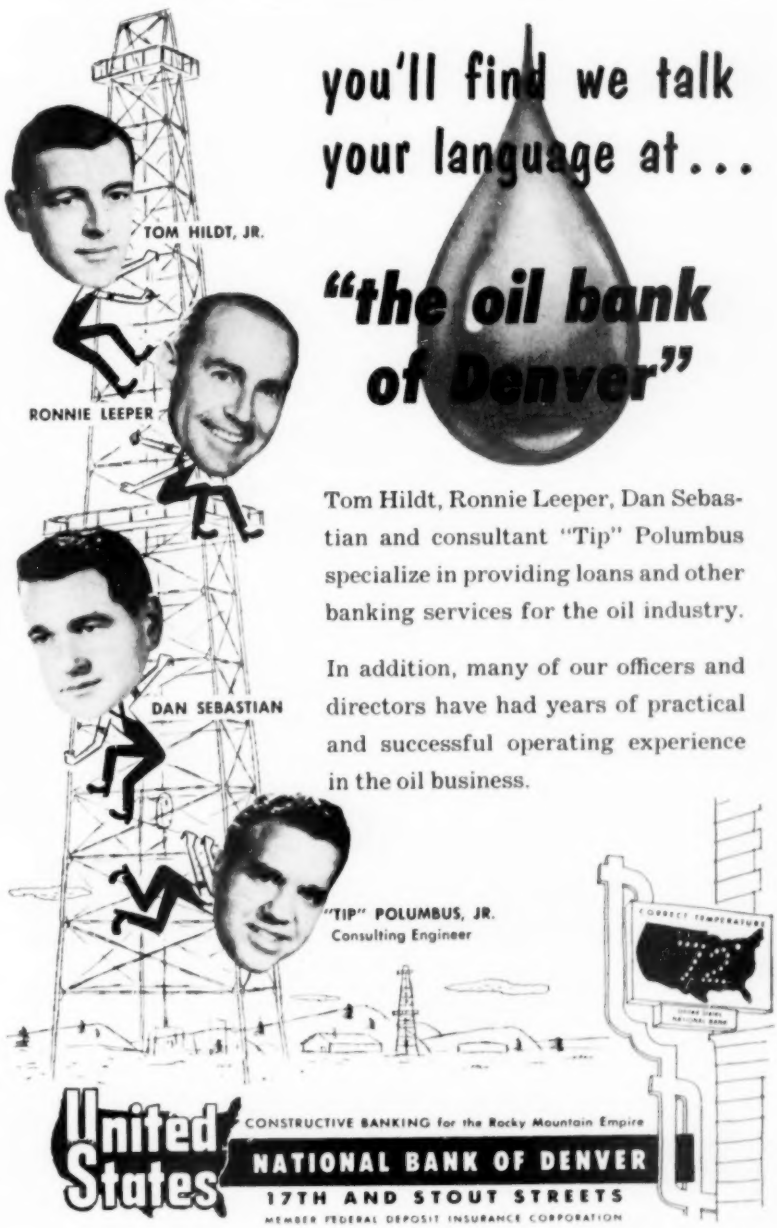
Clay Neal 1-G Waggoner Estate, 8-4-H&TC. Dry. TD 2,456 ft.

P. M. Drilling Co. and Roy Sturgis 1 Waggoner, Blk. 41, MEP&P, A-493. Dry. TD 2,510 ft.

Frank Wood Associates, Inc. 2 Waggoner "Xmas," 3-A534-SPRR. Dry. TD 2,005 ft.

Wise County: Jack Grace Production Co. 1 W. C. Hodge, Blk. 9, Cooke CSL, A-156. IP 140 BO in 6 hr., 32/64-in., 42°, conglomerate pay 5,523 ft. TD 5,843 ft.

Young County: L. T. Burns 1 Leberman,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WILDCAT COMPLETIONS

TE&L Sur. 271, A-518. Dry. TD 3,164 ft.

L. T. Burns 1 Rubenkoenig, J. Poitevent Sur., A-227. Dry. TD 5,188 ft.

J. W. Hastings 1 J. B. Fore, W. J. Davis Sur., A-1303. Dry. TD 3,697 ft.

R. A. King & Sons 1 Davis, TE&L Sur. 67. IPP 87 BOPD, 38°, sand pay 1,068 ft. TD 1,071 ft.

Noel Pautsky 1-A Sims, TE&L Sur., A-701. Dry. TD 3,680 ft.

Superior Oil Co. 1-A Emma Burnett, G. W. Cottle Sur., A-66. IP 52 BOPD, 7/64-in., pay 4,108-11 ft. TD 5,165 ft.

Welch, Daniel & Scott 3 Mahaney, E. J. Ribble Sur., IP 44 BOPD, 10/64-in., pay 3,891-99 ft. TD 3,994 ft.

WEST TEXAS

Andrews County: Texas Gulf Production Co. 1-M University, 20-14-University Lands. Dry. TD 5,010 ft.

Fred Turner Jr. 1 J. E. Parker, 19-A44-PSL. IP 348 BOPD, 3/8-in., 36°, Wolfcamp perforations 8,556-8,624 ft. TD 8,676 ft.

Cochran County: Leland Fikes 1 Lloyd Evans, 15-Y-PSL. IP 34 BOPD, 3/4-in., 30°, pay 4,920 ft. TD 4,940 ft.

Coke County: Dalton H. Cobb et al 1 S. A. Kiker, Sec. 955, S. A. Maverick Sur. Dry. TD 4,007 ft.

Superior Oil Co. 1-161 Price, 161-2-H&TC. Dry. TD 7,375 ft. Tentative Ellenburger top 7,353 ft

Crockett County: P. L. Crandell 1-A University, 1-47-University Lands. Dry. TD 90 ft.

Shell Oil Co. 1 Friend, 93-GH-GC&SF, IP 62 bbl. 73° distillate, 1,300 M.f.g., Ellenburger 8,340 ft. TD 8,490 ft.

Culberson County: Cosden Petroleum Corp. 1 Cockrell, 7-80-PSL. Dry. TD 3,700 ft., elev. 4,014 ft. estimated, Wolfcamp 2,365 ft., Pennsylvanian 2,710 ft.

Gaines County: Humble Oil & Refining Co. 1 Angela Brumley, 8-A12-PSL. IPP 38 BOPD, 27°, pay 7,590 ft. TD 11,092 ft.

Garza County: Tobe Foster 1-A Alice Williams, 20-6-H&GN. Dry. TD 7,520 ft., elev. 2,255 ft., Strawn 7,371 ft.

E. H. Jones 1 K. Stoker, 943-97-H&TC. Dry. TD 2,602 ft.

Hockley County: Great Western Drilling Co. 1 A. R. Copeland, 11-709-A231, State Capitol Lands Sur. Dry. TD 10,525 ft., elev. 3,407 ft., Wolfcamp 7,845 ft., Pennsylvanian 9,080 ft.

Howard County: Murphy Corp. 1 R. G. Wilson, 39-31-T3N-T&P. Dry. TD 7,712 ft., elev. 2,533 ft., reef 7,699 ft.

McCulloch County: Wilson M. Smith 1 Taylor, Sec. 143, H&TC. Dry. TD 1,612 ft.

R. Williamson et al 1 Siler, Sec. 1347, D. Rotherburn Sur. Dry. TD 1,920 ft.

Pecos County: Phillips Petroleum Co. 1-G Puckett, 53-101-T&CRR. Dry. TD 16,575 ft., elev. 3,273 ft., Wolfcamp 5,245 ft.

Reagan County: Plymouth Oil Co. 1 Miller and Bell, 198-1-T&P. Dry. TD 2,860 ft.

Stanolind Oil & Gas Co. 1-F TXL, 225-1-T&P. IPP 138 BOPD, 29°, pay 2,410 ft. TD 9,745 ft.

Runnels County: Murray Petroleum Co. 1 Briley, 321-64-H&TC. IP 192 BOPD, 14/64-in., 38°, Morris sand perforations 3,862-68 ft. TD 4,636 ft.

Ward County: Hissom Drilling Co. et al 1 Gydeson, 9-1-W&NW. Dry. TD 5,153 ft.

G. H. Smith 1 F. G. Smith, 26-34-H&TC. Dry. TD 3,302 ft.

SOUTHEAST NEW MEXICO

Eddy County: Robert W. Atha 1 Magnolia-State, 14-21s-27e. IPP 48 BOPD, 18°, pay 533 ft. TD 538 ft.

A. L. Sherman 1 Ressler, 22-19s-27e. Dry. TD 750 ft., PB 226 ft. for fresh water.

NORTHERN NEW MEXICO

Rio Arriba County: El Paso Natural Gas 1 San Juan 27-4 Unit, SE NW SW 1-27n-4w. IP 1,450 M.c.f. gas per day. Mesaverde gas discovery—new field. Pt. Lookout 6,302 ft. TD 6,353 ft.

El Paso Natural Gas 1 Sparks, SE NW NE 19-30n-4w. Temporarily abandoned. TD 6,748 ft. Pt. Lookout 6,632 ft.

Sandoval County: Avila Oil Corp. 1 Odlum, NW NE NE 15-15n-1w. Dry. TD 5,394 ft. Penn. 4,545 ft.

San Juan County: E. S. & P. C. Brashear 2 Navajo "A," SE SE NE 34-31n-17w. Dry. TD 1,295 ft. Dakota 1,260 ft.

ILLINOIS

Clay County: E. H. Kaufman 1 Lee, NE NE NE 35-3n-7e. Dry. TD 3,138 ft.

Lloyd Kennedy 1 Bonner, NW SE SE 11-2n-7e. Dry. TD 3,162 ft.

Clinton County: R. H. Robben 1 Holtgrabe, W½ SW NE 33-2n-3w. Dry. TD 2,602 ft.

J. R. Bradshaw 1 Tebbe, NW NW SE 1-3n-4w. Dry. TD 980 ft.

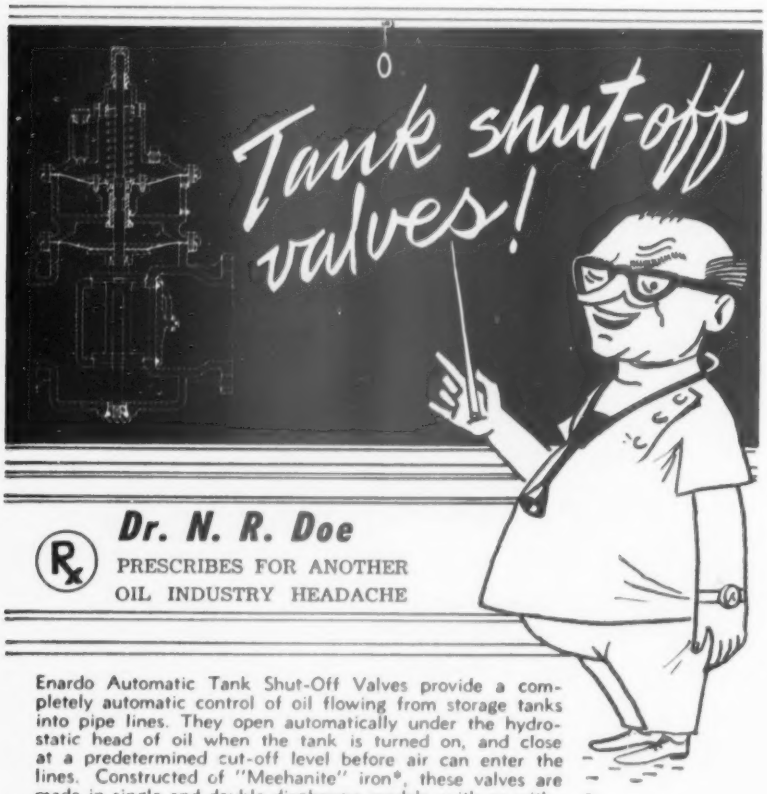
Effingham County: National Association 1 Pendlay, E½ SE SE 22-7n-5e. Dry. TD 2,450 ft.

Hamilton County: C. E. Brehm 1 Gray, NW SW NW 2-4s-7e. Dry. TD 3,423 ft.

National Association 1 Cates-Clayton, SW NE SE 31-4s-5e. Dry. TD 3,463 ft.

The Texas Co. 1 Nation, SW NE SW 9-5s-7e. Dry. TD 3,584 ft.

Lawrence County: Alexander Zanetis 1 Brookhart, NW NE NE 21-4n-13w. Dry. TD 2,305 ft.



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Richland County: Juan Petroleum Co. 1 Weagel, NE SE SE 22-2n-14w. Dry. TD 2,298 ft.
Washington County: Collins Bros. 1 Sikorski, NW SE NW 36-2s-2w. Dry. TD 3,212 ft.
Inland Oil Co. 1 Erbar, NE NW NE 7-3s-2w. Dry. TD 1,420 ft.

INDIANA

Gibson County: Bury Drilling Co. 2 Kendle, SW NE NE 15-2s-11w. Dry. TD 2,390 ft.
Posey County: Fox & Fox 1 Clements, NW NW NW 10-6s-14w. IPP 58 BOPD, Tar Springs 2,238-42 ft. TD 3,054 ft. Discovery of Savah, West pool.
Spencer County: Ace Drilling Co. 1 Rhodes, NW NE NW 8-4s-5w. Dry. TD 1,265 ft.
Coy Oil Co. 1 Raaf, NE SE SE 25-6s-5w. Dry. TD 1,826 ft.
Buchman & Moran 1 Gilbert Maas, SE NW SW 13-7s-7w. Dry. TD 1,766 ft.
Vanderburgh County: F. L. Beard 1 Reininga, SE SW NW 10-5s-10w. Dry. TD 975 ft.
Vigo County: F. B. Cline 1 Moseman, NE NE SE 15-11n-8w. Dry. TD 802 ft.
Steckler & Rea 1 Anderson, SW SW NW 34-10n-9w. Dry. TD 2,233 ft.

KENTUCKY

Daviess County: The Texas Co. 1 Brumley, NW SE NE 22-O-29. Dry. TD 1,865 ft.
Henderson County: Felmont Oil Co. 1 Stanley, SW NE SE 9-Q-26. Dry. TD 2,150 ft.

MICHIGAN

Arenac County: Lakeland Oil Corp. 1 Vaughan, C NW SW 11-19n-6e. IPP BOPD, from Richfield, pay 4,152-63 ft. TD 4,189 ft. (New pool.)
Clare County: Miami Operating Co. and Leonard Drilling Co. B-1 State-Winterfield, NW SE SW 2-20n-6w. IP 50 BOPD from Detroit River "sour zone." Pay at points from 4,710 to 4,820 ft. TD 5,143 ft. (dry in Richfield), PBTD 4,900 ft. (New shallower pay in Cranberry Lake pool.)
Sun Oil Co. 1 Seresaw, NW NE SE 22-19n-3w. Dry. TD 5,234 ft. in Richfield.
Isabella County: Clem Glavin 1 Drallette, NE NW SW 13-15n-6w. Dry. TD 3,803 ft. in Dundee.
Montmorency County: Roosevelt Oil & Refining Corp. 1 Stevens, SW SW SW 27-31n-2e. Dry. TD 2,542 ft. in Richfield.
Oakland County: Sun Oil Co. 1 Gidley et al, NE NE SW 25-2n-7e. Dry. TD 4,220 ft. in Niagaran.
Oscoda County: United Drillers & Producers, Inc. 1 State-Menton, NE SW NW 34-25n-3e. Dry. TD 4,330 ft. in Richfield.
Osceola County: C. W. Jetter 1 State-Hersey, SE NW NW 2-17n-9w. Dry. TD 1,616 ft. in Stray-Marshall.
Van Buren County: Arthur Boeve 1 Ahlert, SW NW NE 1-4s-14w. Dry. TD 1,072 ft. in Traverse.
Normal L. Stevens 1 Montford, SW SW SW 11-4s-13w. Dry. TD 1,181 ft. in Traverse.

WEST VIRGINIA

Randolph County, Roaring Creek district Fox & Trimble 1 King & Casad, elevation 2,526 ft. Dry. Fifth sand 2,290-2,341 ft. TD 2,545 ft.

MARYLAND

Garrett County: W. H. & A. A. Rader 1 Pleasant Valley Church, 100,000 cu. ft. gas, chert 3,911 ft., Oriskany sand, 4,020 ft., gas 4,020 ft., TD 4,101 ft.

WILDCAT COMPLETIONS

PENNSYLVANIA

Fayette County, Springfield Township: Acme Die & Machine Co. 1 Buttermore heirs. Dry. Tully 7,722 ft., TD 7,861 ft.

FLORIDA

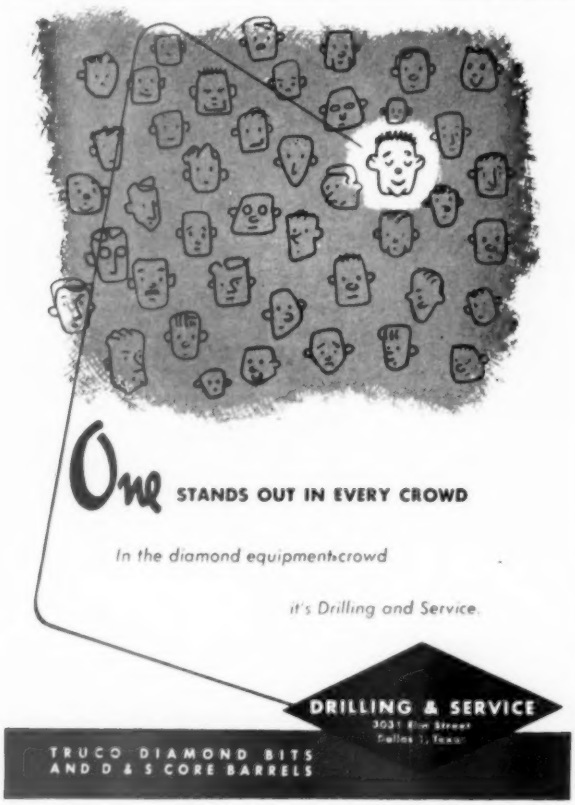
Lee County: Gulf Oil Corp. 1 Consolidated Naval Stores, C NE NE 27-45s-26e. Dry. TD 12,858 ft. Elev. 45 ft., upper Cretaceous 5,530 ft., lower Cretaceous 8,470 ft., lower massive anhydrite 11,774 ft.

ALABAMA

Escambia County: Gulf Refining Co. 2 First National Bank of Mobile, near C SW SE 4-2n-8e. Dry. TD 6,032 ft. Elev. 175 ft., Wilcox 1,205 ft., lower Tuscaloosa 5,541 ft., Massive 5,695 ft., lower Cretaceous 5,953 ft.
Gulf Refining Co. 6 Miller, near C NE NW 18-2n-11e. Dry. TD 5,803 ft. Elev. 172 ft., Wilcox 1,104 ft., lower Tuscaloosa 5,240 ft., Massive 5,413 ft., lower Cretaceous 5,640 ft.

MISSISSIPPI

Amite County: Sun Oil Co. 1-C Board of Supervisors, near C NE NE 16-4n-4e. Dry. TD 7,005 ft. (Stratigraphic test.)
Franklin County: Sunnyland Contracting Co. and Clinch Drilling Co. 1 U.S.A., C SW NW 37-5n-1e. Dry. TD 6,835 ft. Elev. 243 ft., Wilcox 4,656 ft., base Baker shale 6,388 ft., Baker sand 6,447 ft.
Wayne County: Durbin Bond & Co. 1 Wausau-Southern, 26-9n-9w. Dry. TD 5,741 ft. Elev. 319 ft., Chalk 4,295 ft., Eutaw 5,466 ft., City Bank sand 5,537 ft., Stanley sand 5,637 ft.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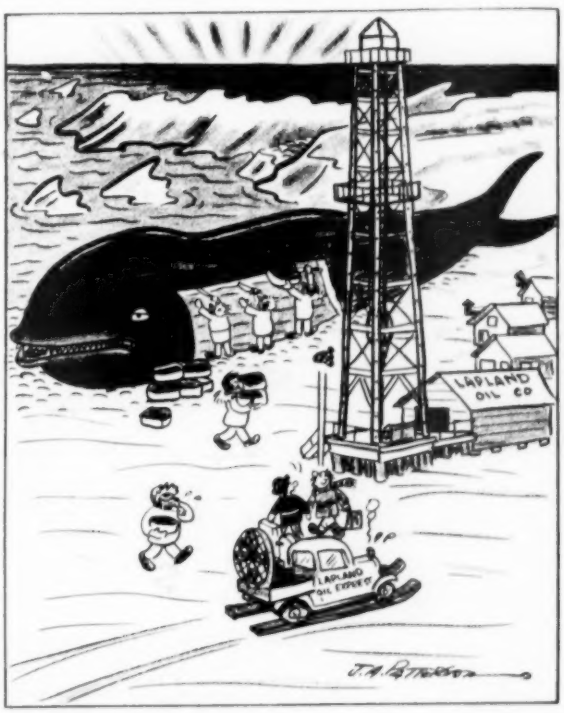

THE OIL AND GAS JOURNAL

"One thing about it up here—they feed you plenty."

WILDCAT COMPLETIONS

NORTH LOUISIANA

Bienville Parish: McCalman Drilling Co. 1 Hutton estate, near SEc SE SW 4-18n-7w. Dry. TD 3,505 ft.

Caldwell Parish: Nebo Oil Co. 1 Fee, C SW SW 26-12n-5e. Dry. TD 4,286 ft.

Concordia Parish: Norton Oil Co. 1 Madison Oil & Development Co. "B," C NE NW 27-7n-8e. Dry. TD 6,420 ft.

E. C. Wentworth 1 Madison Oil & Development Co., C NW NE 19-6n-8e. Dry. TD 6,510 ft.

Ouachita Parish: Amerada Petroleum Corp. 1 Stubbs, C SE NE 34-18n-5e. Dry. TD 2,789 ft.

SOUTH LOUISIANA

Acadia Parish: Ada Oil Co. 1 Baronet, 9-10s-1e. IP 1,000 M.c.f. daily with spray of distillate, 8/64-in. casing perforations at 5,660-68 ft. TD 9,898 ft. (New pay in Crowley field.)

Avoyelles Parish: Union Oil Co. of California 3 Hines, 15-4n-4e (Saline Lake area). Dry. TD 6,503 ft.

Cameron Parish: Kerr-McGee Oil Industries, Inc., 1 Le Bleu, 12-12s-9w. IP 348 BOPD, ⅛-in., 34.3°, casing perforations 10,334-46 ft. TD 13,703 ft. (New field 1½ miles north of Big Lake field.)

Magnolia Petroleum Co. 1 Grunik, 33-14s-9w. Dry. TD 11,413 ft.

Texas Gulf Producing Co. 1 Weber, 33-12s-3w. Dry. TD 10,645 ft.

Evangeline Parish: Magnolia Petroleum Co. 1 Nicke, 15-6s-2w. Dry. TD 12,100 ft.

Plaquemines Parish: Kerr-McGee Oil Industries, Inc., 1-A State Lease 1219, Block 18, Breton Sound. IP shut in. Dry gas, no gage, casing perforations 397-404 ft. TD 8,382 ft. (New pay in Breton Sound Block 18 field.)

St. Bernard Parish: The Texas Co. 1 State Lease 2257, Block 53, Chandeleur Sound. Dry. TD 10,315 ft.

St. John the Baptist Parish: Austral Oil Exploration Co., Inc., 1 Bourgere est., 90-11s-6e. Dry. TD 10,756 ft.

Vermilion Parish: Phillips Petroleum Co. 1 Noel, 9-13s-3e. Dry. TD 13,502 ft.

ARKANSAS

Lafayette County: Group Oil Co. 1 Wise, C NW NW 1-15s-25w. Dry. TD 6,686 ft.

Lonoke County: Seaboard Oil Corp. "J" Core test, C S½ 28-1s-7w. Dry. TD 2,590 ft.

Miller County: Stanolind Oil & Gas Co. 1 Featherstone, C NE NE 31-16s-25w. Dry. TD 5,564 ft.

A. L. Willis et al 1 Hervey, 1,780 ft. S, 150 ft. W of NEc 33-14s-26w. Dry. TD 4,320 ft.

Monroe County: Seaboard "G" Core test, C SW SW SW SE 23-2n-2w. Dry. TD 3,290 ft.

Ouachita County: W. H. Bryant et al 1 Harris, near SEc NE NW 28-14s-18w. Dry. TD 2,650 ft.

Union County: Barron Kidd 1 Sewell, near SWc NW NW 4-17s-17w. Dry. TD 6,898 ft.

Woodruff County: Magnolia Petroleum Co. 14 Core test, near SWc 16-18n-2w. Dry. TD 2,058 ft.

OKLAHOMA

Atoka County: Norris-Kingery-Griffith 1 Nichols estate, SE NE SW 32-2s-9e. Dry. TD 2,960 ft.

Carter County: Jones Oil Co. 1 Jeffery, SE SE NE 31-3n-2e. Dry. TD 9,241 ft.

Cleveland County: Randall R. Morton 1 Fox, NE NE SW 29-8n-1e. Dry. TD 7,018 ft.

Creek County: Roy G. Woods 1 Dumas, NW SE SE 31-14n-9e. IP 1,000 M.c.f. of gas per day, Layton 1,124-34 ft. TD 3,996 ft.

Grant H. Bagley and R. R. Goldsworthy 1 Baker, SE NE NE 6-18n-8e. IPF 2 to 3 BOPD Skinner sand 2,546-56 ft. TD 2,701 ft.

Jefferson County: Beach & Talbot 1 Stallings, SW SW NW 15-4s-4w. Dry. TD 4,028 ft.

Lincoln County: Ketchum-Whan Drilling Co. 1 Moulin, SW NW SW 23-15n-4e. Dry. TD 4,210 ft.

Oklahoma County: Harper-Turner 1 Skelton, NW SW SE 26-11n-1. Dry. TD 6,300 ft.

Washita County: Shell Oil Co. 1 Counts, C NW NE 29-9n-20w. Dry. TD 14,016 ft. Upper Morrow 13,280 ft.

KANSAS

Barton County: Schermerhorn 1 Merten, NW NE SE 35-19s-15w. IPP 10 BOPD, Lansing-Kansas City 3,291-95 ft. TD 3,541 ft. (Opens Clarence pool.)

Butler County: White & Ellis 1 Lasater, NE NW SE 2-26s-7e. Dry. TD 2,779 ft.

Stelbar 1 Stolebarger, NW NE NW 36-29s-4e. IPP 25 BOPD, Bartlesville 2,757-74 ft. (Oil discovery.)

Ellis County: United Drilling Co. 1 Brungardt "A," SE SE SW 13-14s-17w. Dry. TD 3,556 ft.

Lewis Drilling Co. 1 Moore, NW NW SW 24-14s-20w. Dry. TD 3,764 ft.

Finney County: M&L 1 Trekel, NW NW NW 6-23s-31w. Dry. TD 5,020 ft. Miss. 4,843 ft.

Graham County: Imperial 1 Diebolt, NW NE SE 33-10s-23w. IPP 505 BOPD, 3,779-85 ft. TD 3,785 ft. (Opens Diebolt pool.)

Greenwood County: Houston Investment Co.

(Continued on page 220)

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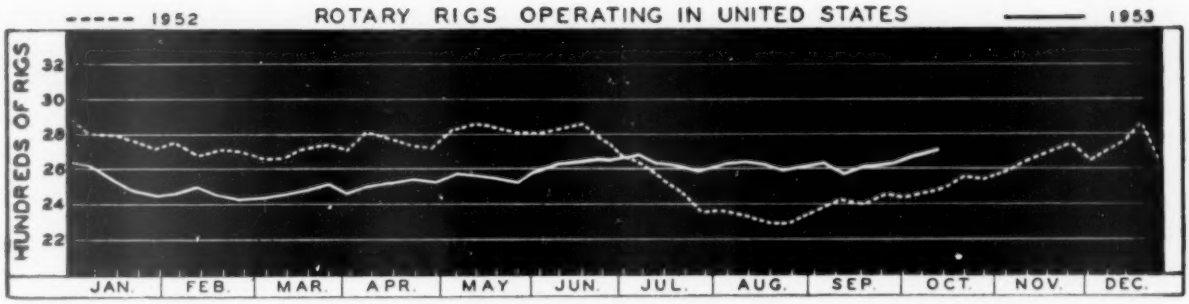
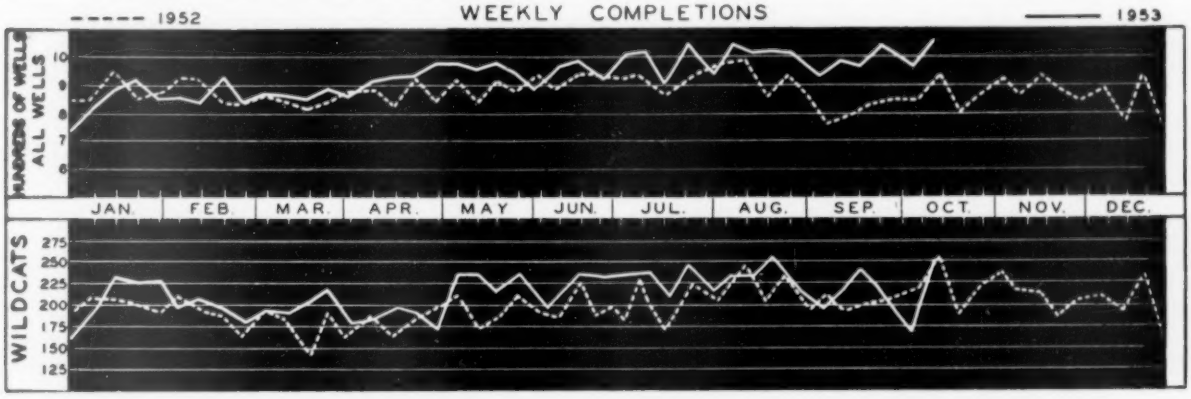




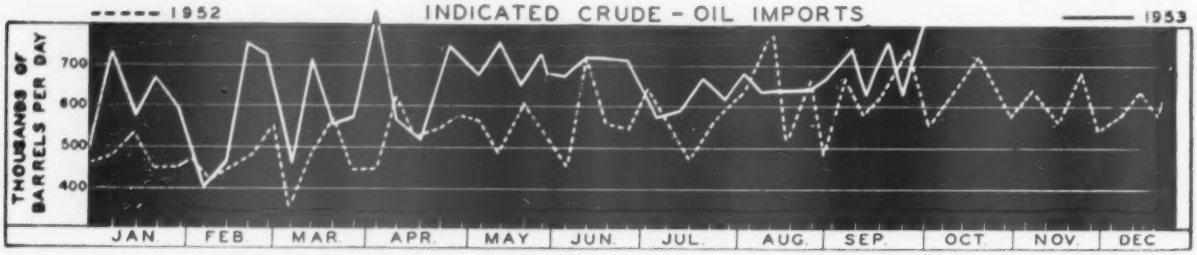
CURRENT STATISTICS

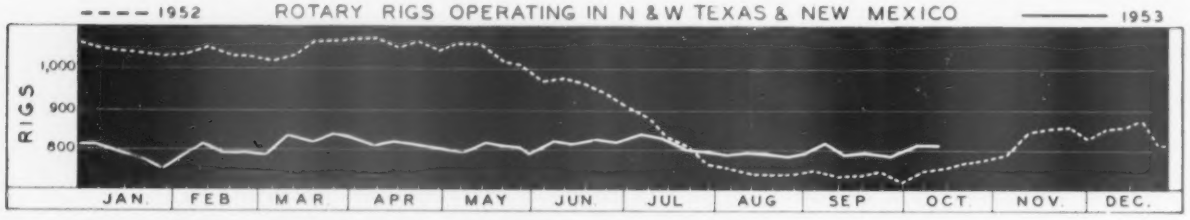
EXPLORATION

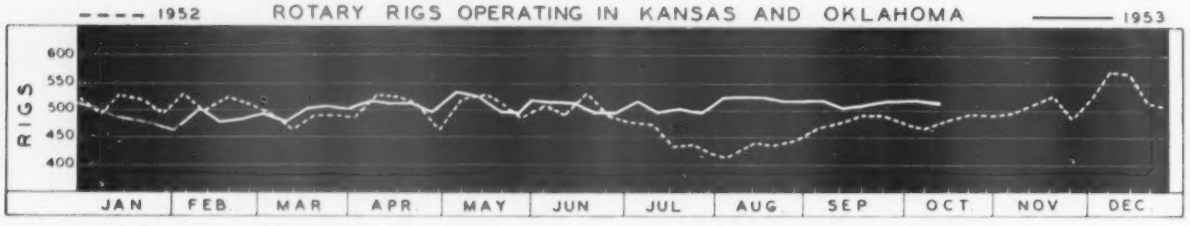
WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 10, 1953

	Total of all wells					Oct. 10		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	16	8	0	*8	23,500	587	632	0	0	0	0	0	0	0	0	0	0
Pennsylvania	40	21	2	†17	67,757	1,469	1,559	0	0	0	1	1	0	0	3	12	15
West Virginia	3	0	2	1	10,362	478	459	0	0	0	1	1	0	0	9	5	14
Ohio	33	12	5	‡16	61,825	832	810	0	0	0	0	0	2	0	3	13	18
Indiana	20	2	0	18	39,783	1,004	987	1	0	0	7	8	12	0	2	277	291
Kentucky	23	9	0	14	38,250	874	1,010	0	0	0	2	2	8	0	1	148	157
Illinois	52	22	0	30	140,805	1,522	1,604	0	0	0	13	13	5	0	0	322	327
Michigan	17	6	1	10	52,215	469	545	2	0	0	8	10	14	0	5	194	213
Kansas	97	44	10	§43	329,393	3,768	3,576	2	0	0	17	19	76	0	30	592	698
Nebraska	3	2	0	1	18,319	255	233	0	0	0	0	0	14	0	4	107	125
Oklahoma	147	91	6	¶50	448,856	5,750	4,455	1	0	1	7	9	97	6	27	481	611
Texas	367	192	34	141	1,658,555	13,273	13,704	21	3	4	91	119	694	48	141	3,254	4,137
North Central (Dist. 7-B & 9)	141	71	2	68	496,191	5,007	4,382	10	0	0	40	50	361	0	16	1,312	1,689
West (Dist. 7-C & 8)	77	54	2	21	420,568	2,898	4,180	6	0	0	15	21	147	2	12	525	686
Panhandle (Dist. 10)	17	7	9	1	51,097	615	531	0	0	0	1	1	0	2	0	16	18
Eastern (Dist. 5 & 6)	21	10	3	8	107,536	614	637	1	0	0	3	4	18	2	5	212	237
Gulf Coast (Dist. 2 & 3)	36	12	6	18	222,084	1,939	2,077	1	1	1	13	16	86	19	56	516	677
Southwest (Dist. 1 & 4)	75	38	12	25	361,079	2,200	1,897	3	2	3	19	27	82	23	52	673	830
Louisiana	68	39	5	24	394,283	2,051	1,787	1	1	1	13	16	65	29	19	287	400
Northern	36	25	2	9	110,369	864	962	0	0	0	5	5	8	2	2	114	126
Southern	32	14	3	15	283,914	1,187	825	1	1	1	8	11	57	27	17	173	274
Arkansas	11	3	0	8	40,656	415	307	0	0	0	8	8	11	0	0	97	108
Mississippi	9	5	0	4	59,091	283	275	0	0	0	3	3	12	1	4	129	146
Southeastern States	3	0	0	3	24,693	115	53	0	0	0	3	3	1	0	0	95	96
Montana	7	4	0	3	26,474	327	236	0	0	0	2	2	12	0	0	81	93
Wyoming	34	23	3	8	172,822	593	508	0	0	1	5	6	20	0	3	107	130
Colorado	13	6	0	7	55,660	534	341	1	0	0	5	6	24	0	10	236	270
Utah	0	0	0	0	0	50	61	0	0	0	0	0	2	0	4	28	34
New Mexico	32	13	14	5	171,763	1,082	808	1	0	1	4	6	17	1	14	98	130
California	59	46	1	12	244,365	1,983	1,890	3	0	0	11	14	51	0	8	447	506
North Dakota	3	1	0	2	21,077	198	75	1	0	0	2	3	8	0	0	51	59
Miscellaneous (Md., S. D.)	2	0	1	1	11,873	65	90	0	0	1	1	2	1	0	4	39	44
Total United States	1,059	549	84	426	4,112,377	37,977	36,005	34	4	9	204	251	1,146	85	291	7,100	8,622
Total previous week	969	521	66	382	3,727,269			21	1	6	142	170	1,112	81	282	6,896	8,371
Total October 11, 1952	923	422	69	432	3,641,562			40	0	4	211	255	1,101	67	196	6,695	8,059

Service wells included: *8, †15, ‡5, §1, ¶4.



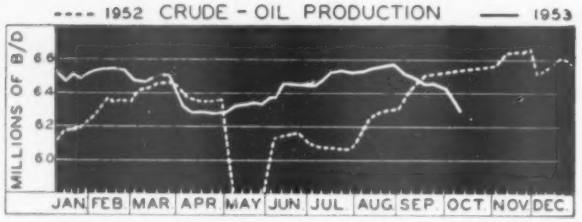


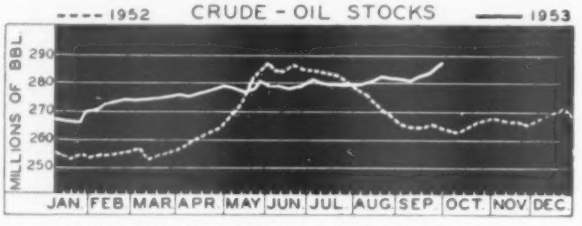


DAILY AVERAGE PRODUCTION FOR WEEK

	October 10			Oct. 3
	Crude oil	Lease condensate	Total	total
Alabama	5,000		5,000	5,100
Arkansas	76,700	400	77,100	78,250
California	999,200		999,200	1,003,400
Colorado	105,500		105,500	111,000
Eastern	60,000		60,000	60,000
Florida	1,550		1,550	1,550
Illinois	165,900		165,900	169,600
Indiana	34,700		34,700	33,700
Kansas	305,400		305,400	306,300
Kentucky	32,700		32,700	31,500
Louisiana	597,300	40,300	637,600	698,550
North	105,450	2,800	108,250	109,600
South	491,850	37,500	529,350	588,950
Michigan	32,600		32,600	32,200
Mississippi	91,300	3,200	94,500	95,000
Montana	33,500		33,500	32,000
Nebraska	14,100		14,100	14,700
New Mexico	203,975	550	204,525	202,675
Oklahoma	523,400		523,400	540,200
Texas	2,692,175	46,200	2,738,375	2,766,050
Dist. 1	38,575	350	38,925	39,500
Dist. 2	145,625	5,100	150,725	152,950
Dist. 3	434,600	24,150	458,750	464,400
Dist. 4	254,375	5,700	260,075	262,150
Dist. 5	47,500	400	47,900	48,325
Dist. 6	122,875	5,000	127,875	130,225
East Texas field	244,500		244,500	248,775
Dist. 7-B	117,950	50	118,000	117,275
Dist. 7-C	163,250	4,150	167,400	166,225
Dist. 8	862,225	900	863,125	873,525
Dist. 9	185,325	350	185,675	187,500
Dist. 10	75,375	50	75,425	75,200
Utah	4,700		4,700	5,000
Wyoming	212,000		212,000	211,000
North Dakota	14,100		14,100	14,100
Total U. S.	6,205,800	90,650	6,296,450	6,411,875
Change from previous week.			down 115,425	
Canada	205,150		205,150	246,350
Total U. S. production January 1-October 10				1,825,633,850 bbl.
Same period last year (crude plus cond.)				*1,754,721,950 bbl.

*Includes 24,167,710 bbl. condensate.



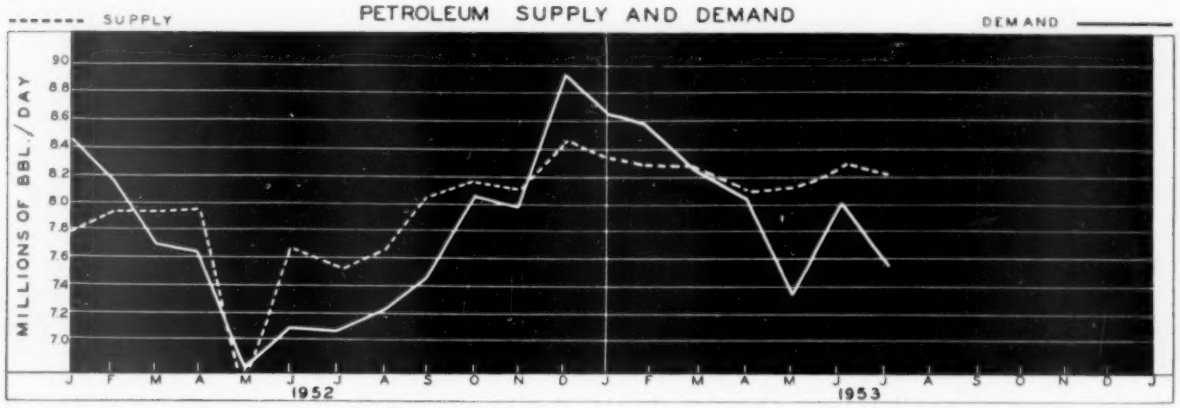


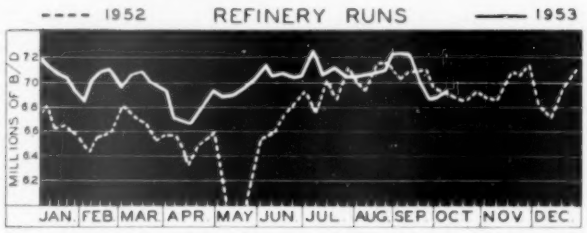
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

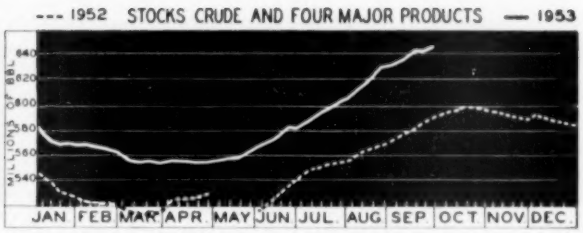
(Thousands of barrels)

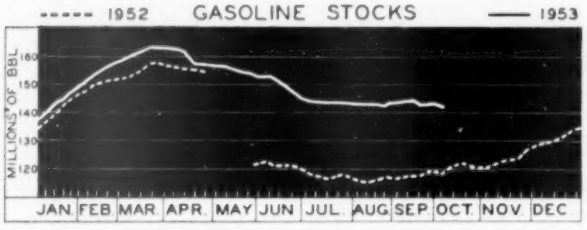
	Oct. 3, '53	Sept. 26, '53	Oct. 4, '52
Pennsylvania Grade	2,809	2,771	2,201
Other Appalachian	2,141	2,119	2,022
Illinois, Indiana, Michigan	12,617	12,222	12,166
Arkansas	3,258	3,029	3,009
Louisiana	16,997	16,849	15,660
North	2,699	2,659	2,390
Gulf	14,298	14,190	13,270
Mississippi	3,636	3,712	3,428
New Mexico	9,394	9,875	7,360
Oklahoma and Kansas	42,366	41,853	38,194
Texas	133,460	133,196	128,324
East Texas	11,866	11,839	12,310
West Texas	59,377	59,040	58,102
Texas Gulf	28,211	28,568	27,440
Other Texas	34,006	33,749	30,472
Rocky Mountain	16,497	16,612	14,503
California	32,947	32,699	30,529
Foreign	†11,646	‡9,710	6,757
Total	287,768	284,647	264,153

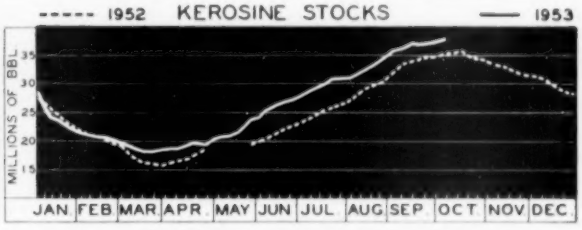
*Bureau of Mines. †Incl. 3,400,000 bbl. in California. ‡Revised.

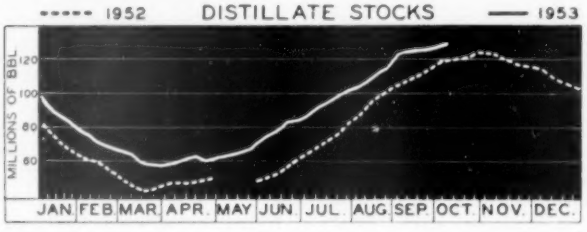


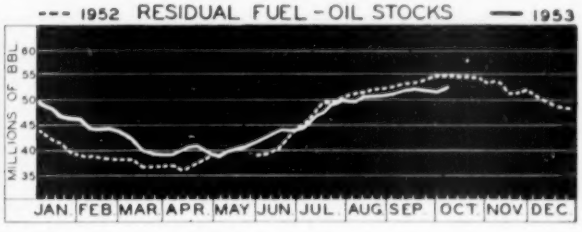










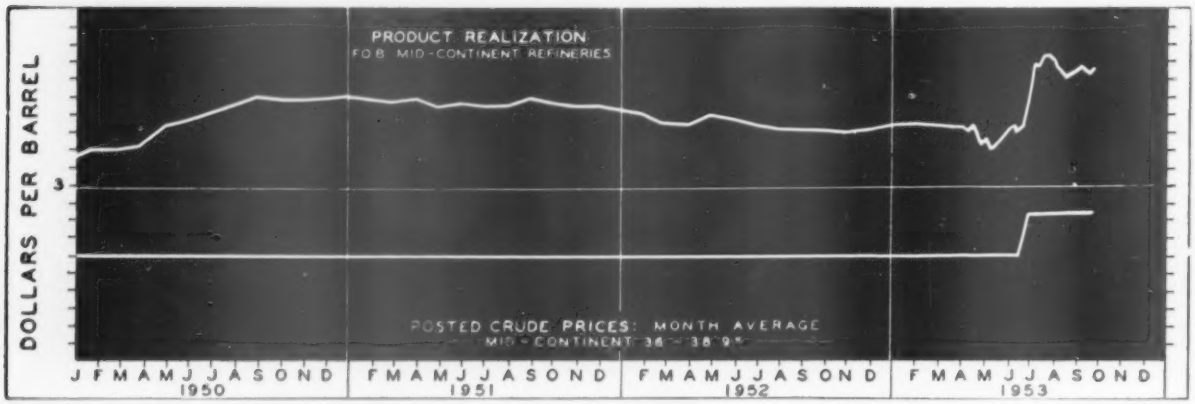


A.P.I. REFINERY REPORT, OCTOBER 10

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1952 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,006	437.0	37.7	258.6	216.3	32,722	14,966	45,937	13,660	1,045	422.7	44.7	254.9	219.6
Appalachian:														
District 1	111	48.9	6.7	15.7	14.0	3,834	593	1,527	722	97	40.8	5.9	17.2	13.9
District 2	92	47.3	5.2	12.1	11.4	1,720	668	632	136	87	40.7	6.7	13.1	13.9
Ind., Ill., Ky.	1,273	703.9	81.4	221.1	164.3	27,030	9,559	23,408	4,699	1,244	674.6	73.6	220.5	159.0
Okla., Kans., Mo.	571	321.7	15.7	122.7	52.6	14,705	2,516	12,768	1,138	565	324.9	11.4	136.6	58.0
Inland Texas	263	182.1	9.6	53.3	32.4	5,838	643	2,491	1,460	265	180.0	12.8	41.4	36.9
Texas Gulf Coast	1,701	815.3	122.4	409.0	246.8	20,270	4,584	16,909	7,712	1,746	780.6	117.5	405.3	268.6
La. Gulf Coast	521	251.7	74.9	116.3	53.6	7,819	2,745	7,275	1,382	525	269.2	61.1	131.0	54.8
N. La. and Ark.	87	40.1	5.9	15.9	6.3	3,119	769	638	112	85	34.4	7.6	21.5	7.0
Rocky Mountain:														
New Mexico	20	12.9		3.0	3.9	153		39	28	18	11.2	0.7	2.9	4.1
Other Rocky Mtn.	235	119.9	3.7	52.9	47.7	4,723	297	2,798	1,049	205	99.2	5.1	39.4	39.6
California	1,061	453.0	5.7	168.3	359.3	20,584	416	14,804	21,243	1,001	422.5	5.1	173.7	328.5
Oct. 10, 1953	6,941	3,432.9	368.9	1,448.9	1,208.6	142,517	37,756	129,226	53,341	6,883	3,300.8	352.2	1,457.5	1,203.9
Oct. 3, 1953	6,893	3,435.0	364.7	1,473.2	1,178.4	§143,111	37,260	127,052	51,912					
Oct. 11, 1952	6,854	3,290.3	377.1	1,442.0	1,169.7	120,910	35,529	120,076	54,423					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines. §Revised.


PRODUCT REALIZATION
FOB MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 36 - 38 9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.67 for week ended October 3, $3.63 for previous week, and $3.33 for October 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of October 14, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11.125-11.625	13-13.8	11.125-11.75
Premium gasoline	12.25-12.875	14.5-14.8	12.25-12.75
42-44 w.w. kerosine	8.875-9.25	10.15-10.4	9-9.5
No. 2 straw fuel oil	7.875-8.25	9.15-9.4	8-8.5
No. 6 residual	$1.20-1.35	$2.15-2.40	$1.85-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6.375	5.875	6.125
Grade 18-55	7.65	7.15	7.40

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13.75
750 vis., No. 3-4 neutral	16.75
2,000 No. 5-6 neutral	18-18.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	20.5-21.5
200 vis., No. 3 neutral, 0-10 pp.	14.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	25.5
180 vis., 10 p.t. neutral	27.5

WAX

Mid-Continent

132-134 A.M.P.	6.0

RESIDUAL fuel continues as the only major product with a strong market in all areas. Total residual stocks amounted to 51,912,000 bbl. on October 3 or 2,705,000 bbl. less than last year. For the areas east of California, residual stocks are down 4,200,000 bbl. The largest reduction has been in District 2 where residual stocks are down 3,013,0000 bbl. The Gulf-East Coast area has 877,000 bbl. less residual with the increase of 905,000 bbl. on the East Coast more than offset by larger withdrawals on the Gulf Coast.

Marketers in the Mid-Continent are watching the heavy-fuel market closely for any signs that would indicate that the higher prices offered for residual are causing any shifts in refinery fuel from resid back to gas.

One of the important factors influencing the residual market in the inland areas has been the increase in coking and the corresponding reduction in residual production. The greatest change, compared with last year, has been in the Mid-Continent. Refiners in this area averaged only 3.87 gal. of residual from a barrel of crude in the first 7 months of this year compared with 4.63 gal. in the same period last year. This means that the average amount of residual made from a barrel of crude by Mid-Continent refiners this year was 16.4 per cent less than in the first 7 months of 1952.

Movement of distillate fuel out of primary storage increased in the last week of September and the early days of October, but stocks are still very high because of the rapid gain during the summer months. Most of the increase over last year can be accounted for by gains on the West Coast and Gulf-East Coast areas. East-of-California stocks on October 3 were 5,871,000 bbl. greater than last year. Gulf-East Coast stocks were up 6,957,000 bbl. and District 2 stocks were down 1,385,000 bbl.

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Prices East of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective September 21, 1953.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.05
Southwest Pennsylvania	3.61
West Virginia	3.55
Ohio	3.54
Illinois Basin	3.02

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EQUIPMENT FOR SALE

MODEL E563-42 Cooper well service unit, servicing to 6000 ft., skid mounted, 8x10x60' mast, excellent condition, $4,500.00. The Zeligson Company, Tulsa, Oklahoma 8-4477. P.O. Box 5008.

FOR SALE: 35 HP. SUPERIOR DIESEL ENGINE. 11" bore, 14" stroke, 200-300 RPM. Serial No. 25066. Type OMA. Price: $800.00. 30 HP. REID FULL DIESEL ENGINE, single cylinder, DR 10¼" bore, 12", stroke. Ser. No. 19676. Excellent condition. Price: $800.00. 12 LATCH JACKS, 2" x 3" threaded connector. Wt. 100# ea. 33" long. Price: $35.00 each. P. O. Box 5, FOB Elyria, Ohio.

OIL FIELD EQUIPMENT
18,000 ft., 4½-in. casing, 11 lb., 85 cents; 25,000 ft., 2-in. tubing, 24 cents; 1,100 ft., 7-in. casing, $1.25; 25,000 ft., ⅝-in. rods, 12½ cents. 6D Jensen jack, $450. Bethlehem jack, $675. National jack, $500. Oilwell jack, $550. 5 hp. motors and controls, $175 ea. Miscellaneous fittings, 2-in. lead line; 100, 250, and 312-bbl. tanks. All equipment nearly new. Floyd Hubbard, Virgil, Kansas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units Westinghouse 20-25-50 KW Generating Units.

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Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

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Complete Rotary Rig Equipped W/Wilson Giant Single Engine Draw Works, GM Twin-Diesel Engines, 7 X 12 8000 Series Wheeland Mud Pump, 96' Lee C. Moore Cantilever Mast, 8' X 24' American Steel Doghouse, 5000' of 3½" Drill Pipe W/Hughes Flash Weld Tool Jts.; 7⅞" Model EW American Overshot complete W/Slips and complete with miscellaneous Tools.

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Portable Gas Compressor Units New

Tailor made to your specifications. 30-350 HP. Working pressures to 1,000 P.S.I.G.

For Sale or Lease

Prompt Delivery

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Phone 2-6293

EQUIPMENT FOR SALE

FOR SALE: At Oklahoma City 2700' 9" OD 40# used J-55 Seamless Steel Casing, 8-V thread ST&C. $3.00 per foot. Also 3500' 9" OD 46.10# LT&C. Ditto $3.60 per foot. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: 10,000'—4½" drill pipe, with tool joints cut off, located at Hobbs, New Mexico. Makin Drilling Company, Box 1628, Hobbs, New Mexico.

EVERYTHING in new and used equipment for well drilling. Fishing tools rented. Save money, get quotations from Pressey & Son, Pueblo, Colorado.

REFINERY AND GASOLINE PLANT EQUIPMENT

11—Griscom-Russell 21-6-144, Style FST Gas Coolers, single pass shell, two pass tubes, 250# WP.
2—Same as above, only 500# WP.
6—Coynco T-144 Atmospheric Cooling Sections, 750 sq. ft. each, 125# WP.
3—Vertical Gas Scrubbers (1) 250# WP, (2) 500# WP.
1—7' 6" x 72' x 1¼", no trays, tower.
2—Goulds Centrifugal Pumps, 2500 GPM, 25' Head, direct connected to 15 HP Explosionproof Electric Motors, 1750 RPM.
50—Compressor Cylinders all sizes for Clark Bros., Cooper-Bessemer, Ingersoll-Rand, and Worthington Gas Engine Compressors.

C. J. SMITH
304 Oil Capital Bldg., Tulsa, Oklahoma
Phone 54-4416

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ATLANTA, GA.

A SURE SOURCE OF SUPPLY AT ALL MARKET LEVELS FOR CASING, TUBING AND LINE PIPE. INQUIRIES SOLICITED.

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FOR SALE at Okla. City whse., 1 used 8" x 3¼" x 8" Ingersoll-Rand type 20 high pressure, 2 stage portable compressor. Serial #PP71898 driven by model GU2S 5¾" x 6¼" Waukesha engine Serial #76426 mounted on steel wheels. Price $1500.00. Cities Service Oil Co., Patridge, Bartlesville, Oklahoma.

FOR SALE

Equipment for Complete Pipe Shop

1—Bignall & Keeler 6 B Threading Machine. Landis Heads 1¼" to 6".

1—Bignall & Keeler #12 Threading Machine. 4" to 14".

1—McFarland Portable Pipe Testing Machine Mounted on Tandem Wheel Trailer.

1—Ingersoll-Rand 3 Cylinder Air Compressor W/15 HP Motor.

1—Master Deluxe Pipe Cleaning Machine W/Wisconsin Engine.

1—Model D-8 Hydraulic Pipe Straightener—100 Ton—W/Wisconsin Engine.

1—Malsbury Automatic Steam Cleaner. Portable.

1—G E Electric Welder W/25 AP Acetylene Generator and HOM #1 Beveling Machine (4" to 6") and HOM #2 Beveling Machine (8" to 12"). All Mounted on 2 Wheel Trailer.

Complete set of motors, cutters, hose, etc., for cleaning inside of 1" to 6⅝" ID Pipe.

1—#502 Oster Pipe Threading Machine W/⅛" to 2" Dies.

Tool Cabinets, Chain Hoists & Trolleys.

This Equipment Purchased New. Used Less Than 1 Yr.

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One with Steel Floating Roof, 114'-6" diameter by 32'-6" high. Riveted construction. Located Wellsville, Mo.

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1546 Guinotte — Phone HA. 1000 — Kansas City, Mo.

EQUIPMENT FOR SALE

FOR SALE—ELI Model M-6 portable drilling rig on GMC Truck. Ideal for water wells. Will consider good spudder as trade. Vaughn & Taylor Construction Co., Inc., 2103 North Grant, Odessa, Texas. Phone 7-2091.

2—Model 19 ELI 24 trace seismograph instruments, with ELI RO-10 Camera, mounted on 1½-ton Ford truck with twin power reels and cables. In operating condition. Priced to sell, only $5,000.00 each. Dayton Exploration Company, 600 East 4th, Tulsa, Oklahoma, Phone 3-6845.

TOW BOAT DEMOPOLIS
Size 140′ by 25′ by 10′ Ideal for conversion into Quarter Boat. Will sell as is or lease and alter to your specifications. EDWARD LEVY METALS, INC., New Orleans, La. Phones: Ma 1455 or Vi 3374.

FOR SALE: Failing Model 1500 drilling equipment. Have available for sale several drills exceptionally complete and in excellent condition. Particularly suitable for water well or deep core work. This equipment relatively new and now operating. Substantial savings possible. Box G-738, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Rotary rig, Cardwell Model R draw works complete with rotary drive Waukesha pump and motor cable attachment and tool shed. Good for 5,000-foot depth. Could be seen in Oklahoma City. C. G. Lucenti, % Pioneer Mfg. Co., Inc., 2352 W. Cermak Road, Chicago 8, Ill.

FOR SALE: One Long Horn Trencher with 12″ cutting buckets in excellent condition. Available for immediate delivery. Contact Modern Welding Company, P. O. Box 5008, Tulsa 16, Oklahoma, or Morder Welding Company, P. O. Box 528, Owensboro, Kentucky.

FOR SALE OR LEASE: Truck mounted pulling unit, perfect condition, 6 WAK, Ideco single drum Hydrair with torque converter and air clutches. Service 10,000′ wells under production derricks. Lee, P. O. Box 2903, Beaumont, Texas.

SULLIVAN 200—Mounted on New Tandem International, complete with all tools. For price and inventory contact—Fleming, 2216 Greenway Blvd., Wichita, Kansas. Phone 5-7717.

STORAGE tank, 1100 bbl. capacity, ¼ plate, riveted, upright 20′ x 21′. Number one condition. Easy to load cars or truck. $1000.00. M. J. Regan Pipe Co., Coffeyville, Kans.

FOR SALE: 4598 feet of 7⅝ inch O. D. Pipe, 26.4 lb., 8 thread, J-55 B Grade, run once, located at Roundup, Montana. Box G-717, The Oil and Gas Journal, Tulsa, Oklahoma.

USED EXCELLENT CONDITION IN OPERATION
One Each (4¾″ to 1″) (8⅝″ to 2⅜″) (13⅜″ to 4½″) LANDIS Leadscrew Receding Head Pipe Threading and Cutting Machine Motor Driven.

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Phone CHarter 6914
P. O. Box 2589 Houston

600′—18″ O.D., ⅜″ Wall. Like new.
10,000′—7″ O.D. Good Used Casing, 20# Lap.
50,000′—4½″ O.D. Line Pipe, A-1, 10.89#.
ALSO
8,000′—3½″, 10,000′—2¼″, and 10,000′—2″ O.D. Number one used, seamless, beveled for welding. Ideal for oil, gas, or water lines.
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ENGINES FOR SALE
1—Type X G.M.A. Bessemer Twin
1—Type X G.M.B. Bessemer Twin
1—Type 80 Cooper Twin
20—Compressor Cylinders, various sizes and pressures. Will sell any of the above as is or completely repaired.

W. S. SMITH
205 Thompson Bldg., Tulsa, Oklahoma
Phone 2-5473

EQUIPMENT FOR SALE

FOR SALE: Used 22-W and 24-L Bucyrus-Erie Spudder. Write or call Beacon Supply Company, Box 606, Farmington, New Mexico. Used 36-L Bucyrus-Erie Spudder, Beacon Supply Company, Box 398, Pampa, Texas.

FOR SALE: 1 Montgomery 3 axle lowboy with International Tractor. Contact Mr. Wm. Bingman, P.O. Box 281—Telephone 5877, Carmi, Illinois.

SULLIVAN 200, trailer mounted, complete with all tools, contact for inventory and price. Mesker Drilling Company, Box 6157, Tulsa. Phone 5-9357.

REDA PUMP complete w/#4—20 Motor, 45½ H.P., 650 Volt, 41.6 Amps. #90—Pump Housing, #5595—Switchboard w/recording Ammeter 3400′—#4 Cable 125 Amp. Auto Transformer Accessories. Engine 225 H.P. Climax Type R-225 on Skid. Alternator G. E. 125—KVA, 100 KW, 440 V. A. C. w/Transformer, Flexible coupling and skid base. House—10′ x 18′ wood frame, w/G.I. Roof and Siding on Skid. Engine—165 Hp. Climax R-61 on Skid. Herndon Drilling Co., 421 Mayo Bldg., Tulsa, Phone 4-9700.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE at our Oklahoma City warehouse: One used Allis-Chalmers, Model UM single drum tractor well servicing unit mounted on rubber tires. No mast or tools, $850.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

SURPLUS EQUIPMENT PRICED TO SELL: Roots, Connersville Blower #30, delivers 100 cu. ft. air per minute at 7½ pounds pressure. Aldrich Triplex Pump, 4 inch bore, 6 inch stroke. Thompson-Hayward Chemical Company, Kansas City 8, Missouri.

11,000′ 2″ EUE 8rd. A1 Used Tubing. 8000′ 4½″ Electrically tested Drill Pipe. 3000′ 3½″ Drill Pipe. Used tubular goods available at all times. Phone 477, Giffin & Thompson Supply, Hoisington, Kansas.

FOR SALE: FOUR Cardwell K-Model Pulling Units complete and in good operating condition; also ONE Cardwell Mobilhoist with spudding attachment, double-pole mast, drill and sand lines, with tools. All equipped with Waukesha Engines. JAMES OIL WELL SERVICE, Hobbs, N. M. Dial 3-2331. P. O. Box 2196.

6000′ 3″ seamless line pipe 35 to 40′ random lengths. No. One 30c. 750′ 5½ seamless casing. 11½ thread. 6″ couplings single random lengths. $1.25. M. J. Regan Pipe Co., Coffeyville, Kans.

FOR SALE: 24 W Bucyrus Drilling Machine, 1945 Model, V Belt drive, semi mounted on 750 duels, leaf springs with vacuum brakes, $5200.00. With following available: Tools, 1950–2 ton Cabover Chev. truck, 1100′ of ¾ drill line & ⅜ sand line, water tank, chain tongs, & numerous hand tools, 200 amp welding machine built into rig, complete $9000. A. & B. Drilling Co., Scobey, Montana.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

INTERESTED in buying good used flat belts. Also parts for Superior and Black Bear Engines, new or used. Texas Consolidated Oils, Box 656, Cement, Oklahoma. Tele. 2521.

WILL TRADE at Aspermont, Texas, 25,000′ or less of 27⅞″ upset J-55 seamless tubing for 2⅜″. Joe A. Huitt, Deep Rock Oil Corp., Tulsa.

INTERESTED in any amount 2⅞ double pin Hydril pipe. Must be in good condition. Box G-724, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WANTED, USED EQUIPMENT, one oil well cementing pump with or without truck. Write W. L. Blakely, Jelloway Place, Danville, Ohio.

NOTICE: We buy. We sell equipment everywhere. If you want to sell or buy, contact Pressey & Son, Pueblo, Colorado.

HELP WANTED

GEOLOGIST WANTED: Fast growing Mid-Western independent (operating nationwide) needs petroleum geologist. Prefer recent graduate with some major company experience. Must be interested in new scientific survey methods and willing to study and promote program based on latest methods. Must be capable of organizing and directing geological department when required. Excellent ground-floor opportunity for right man. State age, education, experience, salary expected, and other details first letter. Replies strictly confidential. Box G-736, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Wanted experienced SEISMIC SUPERVISOR for location in Rocky Mountains. Must have degree in related subject with at least 8 years' experience. In reply please give complete experience and education. Replies confidential. Box G-714, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE CHEMICAL ENGINEERS with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, Post Office Box 381, Tulsa 2, Oklahoma.

PETROLEUM ENGINEERS

FOREIGN SERVICE

Graduate engineers with good background in general physics, mathematics, mechanics and with some laboratory experience in equipment and techniques. For laboratory position responsible for theoretical experimental studies on reservoir fluid and rocks. Duties will consist of designing equipment, performing or supervising, testing and analyzing and reporting results. Studies pertinent to evaluation of primary depletion practices and applicability of secondary recovery for pressure maintenance operation will be required.

Please write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
Box OG-5

Arabian - American Oil Company
505 Park Avenue
New York 22, N. Y.

PETROLEUM ENGINEERS

Major Oil Company in Venezuela has openings for Graduate Petroleum Engineers with 1 to 3 yrs. Production experience; to conduct Engineering Studies on Production Methods, Procedures, & Special Projects.

Also having openings for Petroleum, Mechanical & Chemical Engineers for work in Production, Drilling & Gas Departments.

P. O. BOX #35
Bowling Green Station
New York 4, New York

HELP WANTED

GEOPHYSICIST—For Caracas, Venezuela, to assist Chief Geophysicist. Must be fully qualified in interpretive work, field supervision and correlating geophysical information from various sources. Will assist in planning and directing geophysical field program. Should have college degree in geology or geophysics and a number of years geophysical experience in a supervisory capacity. Liberal salary and living allowance. Give full details in reply to P. O. Box 2819, Dallas, Texas.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

CHEMICAL ENGINEER
UNUSUAL OPENING

Exceptional opportunity with small well established engineering firm for young chemical engineer—preferably major company or equivalent experience. Good educational background and 3 years or more experience with modern refinery processing and design, especially catalytic cracking and general refinery economics. Activities very diversified in desirable U. S. location. Some but not continuous traveling.

This position offers outstanding opportunity for ambitious and resourceful engineer who can take responsibility for many diverse activities in petroleum refining and chemical fields. Salary commensurate with ability.

Box G-734
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

Micropaleontologist

Preferably with an advanced degree and a minimum of 5 years' commercial or academic experience. To work in the New York research laboratory of a major oil company. This position demands broad interests in Stratigraphy and Biofacies and the capacity to do independent work on projects assigned. Salary dependent on experience and qualifications.

Write giving personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OGJ
Arabian - American Oil Company
505 Park Avenue
New York 22, N. Y.

Engineers needed for development, field and sales work in Rky. Mtns., W. Texas and Calif. with expanding service company. Experience not necessary. State qualifications and salary expected. Photo desired. Write

BJ SERVICES, INC.
6505 Paramount Blvd.,
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HELP WANTED

GEOLOGISTS

SUBSURFACE

With degree in Geology and a minimum of 3 years' subsurface experience on deep wells. To work in Saudi Arabia on deep wells making lithologic and faunal logs from cores and cuttings, interpreting electrical logs and working on field and regional stratigraphic studies. Salary commensurate with experience and qualifications.

JUNIOR

Recent graduate with limited or no experience, for on-the-job training in Saudi Arabia.

Write giving personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OGJ
Arabian - American Oil Company
505 Park Avenue
New York 22, N. Y.

WANTED FOR EMPLOYMENT: Petroleum Engineer or Geologist with two or three years' experience in Louisina Gulf Coast. Duties will entail preparation and maintenance of detailed structure and isopach maps of south Louisina fields and evaluations necessary in field studies. Work located in New Orleans with reliable and financially strong concern. Reply giving age, experience in detail and salary desired. Inquiries will be kept strictly confidential. Our employes know of this ad. Box G-713, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE SECRETARY for work with major oil company in Tulsa. College degree. Geological or Geophysical experience desirable. Age 25 to 35. State experience and qualifications. Box G-728, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING ENGINEER

SOUTH AMERICA

Major oil company affiliated with Standard Oil Company (New Jersey) has an attractive staff position available for qualified engineer.

Must have engineering degree and several years' responsible drilling engineering experience. Duties will include mud control, penetration tests, cost estimates, drilling equipment studies, etc.

Write giving age, marital status, education and detailed experience resume.

Box 308-N
Radio City Station
New York 19, N. Y.

HELP WANTED

SEISMIC SUPERVISOR required by expanding and aggressive seismic contracting company. Should have ability to supervise any domestic area and have good professional contacts. Minimum requirements; college degree in geophysics or related fields and eight years' seismic experience. Good future. Tulsa location. Box G-705, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 434 Frick Bldg., Pittsburgh 19, Pa.

OIL industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

GULF COAST GEOLOGISTS, one highly experienced, and one less experienced, for office we will open City National Bank Building in Houston. Replies will be held in strict confidence. Hunt Oil Co. Dallas, Texas.

SOUTH AMERICA. These jobs are with one of the better oil companies. Our fee paid. Mechanical Engineer—graduate, no experience required. Petroleum Engineer—graduate, no experience required. Chemical Engineer—graduate, no experience required. Mud Technician—two or more years' experience, single. Accountant—college graduate, Accounting major, single. All information confidential and should be mailed to CHAS. J. LOVELESS PERSONNEL SERVICE, 616 S. Main, Tulsa, Oklahoma. Phone 3-5168.

SALES ENGINEER: To represent well known valve manufacturing company. Must be college graduate, married, age 28 to 35. Willing to headquarter in Pittsburgh, Pennsylvania, and free to travel eastern states calling upon refineries, petrochemical plants, oil and gas producing companies and utilities companies who produce and distribute natural gas. Job is salaried with automobile and reasonable expenses allowed. Prefer someone with knowledge of valve applications and above type plants. All replies confidential. Furnish small photograph with application. Box G-741, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED refinery superintendent for Midwest independent refinery. Chemical engineering desirable. Initial letter application should set out past experience in detail, education and salary requirements. Replies strictly confidential. Box G-743, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

DRILLING Contractor Contact Man: Extensive experience in drilling completion. Canada, Rocky Mountain, and Gulf Coast. Box G-740, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

LANDMAN—Title, Rental, Division Order and Utilization experience—6½ years with major oil company. Desires change to expanding independent. Now in Gulf Coast Area. Can relocate and travel. BS degree. Age 29. Box G-737, The Oil and Gas Journal, Tulsa, Oklahoma.

DRLG. SUPT.: Nine years' experience, all phases drilling and well completion, Gulf Coast, offshore, Mid-Cont., Okla., Kans., Colo., Neb. & Wyo. Plus one year in South America. Dual and triple zone well completion and reservoir engineering. Have been in oil work since 1934. Graduate Petroleum Engineer. Box G-731, The Oil and Gas Journal, Tulsa, Oklahoma.

MAJOR company drilling superintendent experienced in drilling, completion and production of oil and gas wells in the Mid-Continent area seeks operating position with progressive organization which can more fully utilize latent abilities. Engineering background, 36, married. Box G-732, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

MECH. ENGINEER: 12 years' refinery experience. 4 years in eng. design; 8 years in plant operation & maint. 37 years old, married. Desire responsible position with Engineering Co., Southwest preferred location. Box G-733, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE MANAGEMENT—Exploration Programs (geological, land, drilling), engineering graduate, age fifty, wide experience, recently Kansas. Will consider retainer and participation, or straight salary. Box G-744, The Oil and Gas Journal, Tulsa, Oklahoma.

AREA SALES MANAGER. Drilling and completion equipment. Ten years' actual field experience. Box G-739, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, B.S., 28, married, 26 months oil field experience, desires job anywhere in U. S. Write Box 1751, Hobbs, New Mexico.

PETROLEUM geologist and engineer having substantial managerial experience in production and exploration desires position offering opportunity and enterprise. Box G-721, The Oil and Gas Journal, P.O. Box 1260, Tulsa, Oklahoma.

OIL ECONOMIST - BUSINESS ANALYST-BUDGET DIRECTOR. Ph.D., 38, qualified Business Economist, Assistant Treasurer—Controller. Available for interview. Box G-742, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION Permanent Independents and Reliable Investment Groups: PRACTICAL OIL GEOLOGIST locating in Denver about Nov. 1. Age 30. 5½ years with major company in Texas, La., New Mexico, and Western Colorado. Native of Oklahoma. Personal and business contacts throughout the Rockies, Mid-Continent and Texas. Bachelors and Masters degrees. Experienced at field development; conceiving, supervising and executing local and regional structural and stratigraphic studies; and training geologic personnel. Expert sample man and well sitter. References. Desire full or part time consulting position which includes opportunity to participate. Write Box 95, Denver, Colorado.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

DRILLING DEALS—80 and 100 acre leases in Montgomery County, Kansas. Write W. J. Forsyth, 117 So. Penn., Independence, Kansas.

FOR LIQUIDATION. Leases San Juan and Debaca Counties, New Mexico. $360,000 court judgment 33,000 acres Missouri; may have oil. Box G-735, The Oil and Gas Journal, Tulsa, Oklahoma.

80,000 ACRES Tennessee mineral-timber land. $3.30 acre. All mineral rights. Details, E. Jester, 12744 Vanowen, North Hollywood, Calif.

WYOMING-GREEN RIVER Basin-Middle Mountain Area. Small, very choice fee lease (280) acres close to well producing 6,000,000 cu. ft. sweet gas and 165 bbl. of 41°-gr. oil per day. Approximately 6000 ft. or less will test four (4) possible pay horizons. Gas pipe line connection nearby. No bonus required. Will gamble on override or oil payments. Have a well-known, reliable Texas drilling contractor who will take a 25% interest in this venture and assume operating responsibility. Approximately $65,000.00 needed to purchase other 75% drilling interest. Cost of subsequent development wells should be much less. A. E. Mills, Phone 139, Glenrock, Wyo. P. O. Box 105, Casper, Wyo.

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WANTED: Lease to drill, not over 4,000 ft., in Oklahoma or Tri-State Area. Box G-726, The Oil and Gas Journal, Tulsa, Oklahoma.

SHALLOW OIL FIELD, 1000-acre lease, three wells just completed, laboratory reports. Will **TURN IT OVER** for enlargement or sell for $45,000.00. Excellent water flow. Mr. C. Shepard, 1314 South Grant, Chanute, Kansas.

DRILLING DEAL: Pawnee County, Oklahoma; 240 acres; 3 sands; between production; demand reliable operator, quick action; 2800 feet. Phone 1258, Seminole, Oklahoma.

FOR SALE: 6,000 acres federal leases in Powder River basin. 12,000 acres in Utah. A. C. Trapp, 1477 Ridgeway Rd., Dayton, Ohio.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

ROYALTIES

QUICK Cash for your producing royalties, over-riding royalties, and production. Robert Kinkaid, Post Office Box 26, Tulsa, Oklahoma.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

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WILDCAT COMPLETIONS

(Continued from page 212)

1 Ross, SW SE SW 11-27s-12e. Dry. TD 2,020 ft.

Meade County: Columbian Fuel 1 Patterson, C NE SW 17-33s-30w. Dry. TD 5,925 ft. Chester 5,699 ft.

Pratt County: J. Van Zant-National Cooperative 1 Peachy, NE NE NE 2-29s-13w. Dry. TD 4,763 ft.

Reno County: Brooks Pierce 1 Swanson, SE SE SW 22-23s-5w. Dry. TD 3,985 ft.

Rice County: Lindas 1 Farmer, NE NE SE 25-20s-10w. Dry. TD 3,370 ft.

Rooks County: Francis Oil & Gas Co. 1 Dryden, SW SW NE 30-6s-19w. Dry. TD 3,660 ft.

Rush County: Bennett & Roberts 1 Legleeter, NE NE SE 30-16s-18w. Dry. TD 3,649 ft.

Sedgwick County: Gaty 1 Schuessler, SE NE NW 6-25s-2e. Dry. TD 3,053 ft.

Gaty 1 Ritchie, NW NE NE 30-25s-2e. Dry. TD 3,023 ft.

Trans-Era et al 1 Calloway, SE NW NE 30-29s-1e. Dry. TD 3,854 ft.

Seward County: Huber 1 Blucher, C SW NE 13-35s-31w. Dry. TD 6,350 ft. Chester 6,143 ft.

Smith County: E. W. Whitney 1 Jacobs, SE NE SW 28-4s-13w. Dry. TD 4,198 ft.

Stafford County: Petroleum, Inc. 1 Keenan "E," NW SW SW 20-22s-13w. Dry. TD 3,924 ft.

SOUTH DAKOTA

Butte County, Redig area: Amerada Petroleum Corp. State, NW NW 4-4n-4e. Dry. TD 7,772. Winnipeg sand 7,320 ft.

NORTH DAKOTA

Billings County Fryburg, Amerada Petroleum Corp. 1 Herman May, C NW NE 9-139n-100w. IPF 2177 BOPD through 18/64-in. choke. Cambrian 13,240 ft. TD 13,325 ft. PB 8,430 ft.

Stutsman County: Herman Hanson Oil Syndicate 2 Martha M. Mueller, NE NE 20-140n-65w. Dry. TD 3,316 ft. Pre-Cambrian 3,304 ft.

Towner County: Midwest Exploration 1 Henry P. Juntunen, NW NW 27-163n-68w. Dry. TD 4,436 ft. Granite 4,433 ft.

CALIFORNIA

Fresno County: Gene Reid Drilling, Inc. 43-30 R.O.P., 30-13s-17e. Dry. TD 4,900 ft.

Humbolt County: Richfield Oil Corp. 2 Walker, 17-1s-2w. Dry. TD 3,650 ft.

Kern County: Coastline Oil Co. 2 Reserve, 22-11n-18w. Dry. TD 1,411 ft.

Honolulu Oil Corp. 2 Honolulu-C.C.M.O. fee, 15-30s-21e. Dry. First Point of Rocks sand 4,328 ft., TD 5,632 ft.

Intex Oil Co. 1 Gill, 24-26s-27e. Dry. TD 2,077 ft.

Kings County: Standard Oil Co. of California 33-1 S. P., 13-23s-19e. Dry. TD 5,600 ft.

Los Angeles County: General Exploration Co. 1 C.C.M.O., 17-2s-12w. IPF 427 BOPD, 18/64-in. choke, 38.7° gravity, perfs. 6,278-6,318 ft., TD 6,766 ft. (New field discovery 1 mile west of East Los Angeles field.)

Rothschild Oil Co. 1 Lopicollo, 12-3s-11w. Dry. TD 8,550 ft.

Orange County: Victor W. Posta 1 Pacific, 18-6s-10w. Dry. Drilled deeper from 3,735 ft., new TD 5,765 ft.

Solano County: Union Oil Co. 1 Union-Brazos-Ward, 30-3n-1e. Dry. TD 8,966 ft.

Wa-Me-Co Drilling Co. 1 Ideal, 17-5n-1w. Dry. TD 1,012 ft.

Tulare County: Corwin Drilling Co. 1 Wadley, 17-22s-27e. Dry. TD 1,868 ft.

Ventura County: General Petroleum Corp.

11 Ferguson, 7-3n-24w, IPP 64 BOPD, 31° gravity, perfs. 2,983-3,036 ft. in Miley shale, OWPB, TD 3,429 ft. (New pool discovery in Rincon field.)

Shell Oil Co. 378 Taylor, 20-3n-23w, IPF 620 BOPD, 20 per cent cut, 20/64-in. bean, perfs. 12,210-13,055 ft., TD 15,436 ft. (Extension to D-8 zone in Ventura Avenue; first field well to drill into Miocene formations.)

MONTANA

Cascade County: Taft Hall, Art E. Deininger 1 Fitzgerald, NE SE SW 24-20n-1e. Dry. TD 790 ft. Madison 787 ft.

Rosebud County: NW Sumatra area, Robert L. Harris et al 1 Texas State, C NE NE 20-11n-32e. Dry. TD 4,946 ft. Amsden sand 4,594 ft.

WYOMING

Big Horn County, Manderson area, Outside Unit: Socony Vacuum Pegasus Division F-41-4-G, W½ NE NE Lot 5, Sec. 4-49n-92w. Dry. TD 7,442 ft. Temporarily suspended.

N. W. Byron, Delhi-Delti 2 Oborne, SE SE of Lot 37, Sec. 16-56n-97w. Dry. TD 6,740 ft. Madison 6,268 ft.

Carbon County, Diamond Dome: Roden, Darden & McRae 1 Federal, SE NE SW 6-20n-77w. IP 3,000 M.c.f. gas per day. Shannon discovery—new field. Sundance 5,583 ft.

Johnson County, South Meadow Creek: H. L. Hawkins 2 Government, SE SE SE 23-41n-78w. Dry. TD 7,484 ft. Lakota 7,434 ft.

Natrona County, East Teapot: Midland Oil Co. 3 Government, NW SE NE 11-38n-78w. Dry. TD 4,578 ft. Dakota 4,521 ft.

Sweetwater County, Lost Creek Anticline: Oil Corporation of America 1 Government, SW SW SW 7-25n-94w. Shut down indefinitely for larger rig. TD 8,777 ft. Lewis shale 6,500 ft.

COLORADO

Archuleta County: Francis Harvey 1 Government, C SW NW 4-36n-2e. Temporarily abandoned. TD 1,221 ft.

Delta County: W. S. Meader 1 Hotchkiss, SW NE NE 12-15s-93w. Dry. TD 1,102 ft. Granite 1,060 ft.

Montezuma County: Cortez, Locke-Taylor 1 Dixon, NW NW NE 20-36n-14w. Suspended. TD 1,250 ft.

Washington County: Rago, Vaughey & Vaughey 1 Alexander, NW NW NE 12-1s-55w. IPP 106 BOPD, "D" sand discovery—new field. "J" sand 4,850 ft. TD 4,892 ft.

Morgan County: Creslenn Oil Co. 1 Nuss, SE SE NW 14-4n-55w. Dry. TD 5,100 ft. "J" sand 4,957 ft.

Washington County: Twin Oil Corp. 1 Daniels, SW NW SW 20-4n-53w. Dry. TD 5,100 ft. Skull Creek 5,099 ft.

MANITOBA

California-Standard 12-16 Whitewater Lake, LSD 12, 16-3-21w1. Mississippian lime oil well. Swab rate 5 BOPH. TD 2,539 ft.

SASKATCHEWAN

Socony-Woodley-Southern 35-9b South Success, SW¼, LSD 9, 35-16-16w3. Roseray sand gas well. 7-in. 3,219 ft. TD 3,410 ft.

Delhi-Husky-Phillips 1 Jones Creek, LSD 1, 9-9-20w3. Dry. TD 4,983 ft.

Socony-Sohio 1 Kutawagon, LSD 12, 29-29-19w2. Dry. TD 3,521 ft.

Gulf-Canadian Devonian 8 Ludwig, LSD 8, 22-5-4w2. Dry. TD 4,819 ft.

Socony-Sohio 1 Elbourne, LSD 5, 11-25-20w2. Dry. TD 3,768 ft.

Socony-Woodley-Southern 1 Gainsborough, LSD 15, 29-1-32w1. Dry. TD 4,802 ft.

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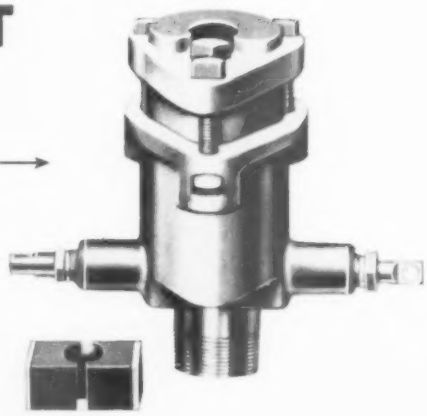

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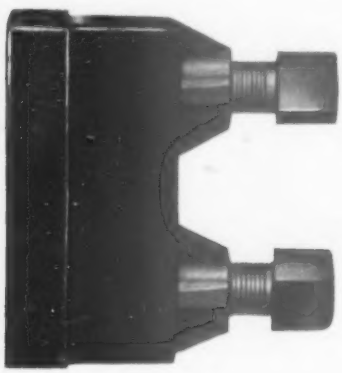

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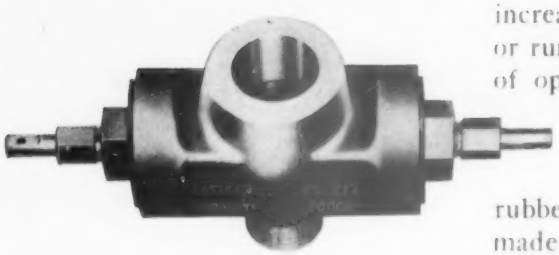

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